STATES AND CHANGES-OF-STATE: A CROSS-LINGUISTIC STUDY OF THE ROOTS OF VERBAL MEANING

JOHN BEAVERS
The University of Texas at Austin

MICHAEL EVERDELL
The University of Texas at Austin

KYLE JERRO
University of Essex

HENRI KAUHANEN
University of Konstanz

ANDREW KOONTZ-GARBODEN
The University of Manchester

ELISE LEBOVIDGE
University of Washington

STEPHEN NICHOLS
The University of Manchester

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 describing specific actions and states for a given verb. An open question is what the division of labor is between the template and the root in a given verb's event template, and whether their meanings are bifurcated: are broad eventive lexical entailments 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 would make 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) nondeadjectival 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. This supports a theory wherein *crack*-type roots entail change independent of the template, contra bifurcation. This supports a more complex, albeit still principled, theory of possible event structural meaning and its grammatical correlates, one that takes subclasses of roots into account, while showing the value of this type of crosslinguistic methodology for testing the predictions of event structural approaches.*

Keywords: Lexical semantics, events, event structure, change-of-state, root, typology

*This material is based upon work supported by the National Science Foundation under grant no. BCS-1451765. Publication fees and portions of the research were funded by European Research Council Consolidator Grant ERC-2017-COG 769192. All morphological data collected for this study is available online at https://verbal-roots.la.utexas.edu/, and computer code to replicate all our analyses can be downloaded from https://github.com/hkauhanen/verbal-roots. We are especially grateful to Line Mikkelsen, Gillian Ramchand, and two anonymous reviewers for their detailed comments on an earlier draft, as well as to Ashwini Deo and Itamar Francez for both discussion and judgments on Marathi and Hebrew respectively, Serge Sagna for data and discussion on Gújjolaay Eegimaa, Daniel Valle for discussion and help collecting Kakataibo data, Cristian Juarez for help collecting data on

1. INTRODUCTION. Sentences entailing changes of states can take quite different forms in their morphology and syntax, both across languages and even internal to a single language, as in the English examples in 1.

(1) a. The sky became black.
b. The rug flattened.
c. The vase cracked.

All of 1 entail that some specific state has changed in an individual by the end of the described event: the blackness of the sky in 1a, the flatness of the rug in 1b, and the vase's material integrity in 1c. Yet the grammatical forms of the expressions describing the change differ significantly: a light verb with an adjectival complement describing the state in 1a, a verb formed from an adjective plus *–en* in 1b, and a monomorphemic verb in 1c. Semantically, analyses going back to Lakoff (1966: IV-4-IV-14) treat examples like 1a,b similarly, with the stative inferences and the inference of change introduced separately, by the adjective for the former and a light verb/*–en* for the latter. The empirical question we address is whether this separation of change and state in change-of-state predicates holds for all change-of-state verbs, and specifically whether it is also always the case that even monomorphemic change-of-state verbs like in 1c have change and state separated at some level of representation that feeds into semantic composition.

The answer to this question bears directly on the more foundational question whether there exist grammatical constraints on word meanings. The starting point for our work is the common assumption that verb meanings consist at least partly of an EVENT STRUCTURE defining the kinds of events the verb describes (see e.g. Lakoff 1966, 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 built from 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 common 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 fairly homogeneous morphosyntactically (see e.g. Levin 1993). Within a class the main overt distinction between verbs is their idiosyncratic morphological roots, essentially being the overt signal of a verb's lexical semantic root. Returning to states and change of state, the state is defined by the lexical semantic root, which with no additional semantic content determines the meaning of simple adjectives or other stative forms as in 1a. Augmentation of this lexical semantic root by a template often reflected overtly by light verbs as in 1a or

Mocoví, Jaime Pérez Gonzalez for data from Tzeltzal and help with Spanish, Sandie Keerstock for help with French, Connie Loos and Kirsten Meeman for help with German, and Scott Spicer and Maayan Haim for help with Hebrew. We also thank Luke Adamson, Daniel Altshuler, Elena Anagnostopoulou, Fernanda Barrientos, Nora Boneh, Jurgen Bohnemeyer, Alex Brown, Beaudry Chase, Heidi Harley, Matthew E. Husband, Nikki Grant, Larry Horn, Itamar Kastner, Jean-Pierre Koenig, Beth Levin, Jacques Lefleur, Fabienne Martin, Louise McNally, Victor Mena, Laura Michalis, Seungho Nam, Johanna Nichols, Peter Petré, Tillmann Poss, James Pustejovsky, Malka Rappaport Hovav, Helen Salgi, Giorgos Spathas, Lindia Tjuatja, Elly van Gelderen, Julia Zinova, Joost Zwarts, and audiences at The Linguistic Society of America 2017 Annual Meeting, Beyond Time 2017, Endpoints 2018, The University of Edinburgh, Seoul National University, and The University of Texas Department of Linguistics syntax/semantics research group for their feedback. Henri Kauhanen was funded by Emil Aaltonen Foundation, The Ella and Georg Ehrnrooth Foundation, and the Federal Ministry of Education and Research (BMBF) and the Baden-Württemberg Ministry of Science as part of the Excellence Strategy of the German Federal and State Governments. Finally, we are imminently grateful to Stacy Vlasits for his technical expertise.

affixation as in 1b introduces change. The addition of extra event structure can explain why change-of-state predicates are sometimes more marked than their more basic stative counterparts, as is transparently the case in 1a,b.

A long-standing assumption in the literature is that possible and impossible verb meanings can be predicted from the inventory of templatic operators and how they combine with each other and lexical semantic roots. This presupposes a restrictive theory of what a possible template meaning is for any verb and what a possible lexical semantic root meaning is. If either could in principle mean anything, then a verb or related word category could mean anything regardless of its event structure. To date the field has mostly focused on the truth conditional contribution of templatic primitives, beginning in particular with Dowty's (1979) groundbreaking study, and significant headway has been made here. For example, it is reasonably well established that the type of causation found in change-of-state verbs is fairly direct (see e.g. Fodor 1970, Shibatani 1976, Dowty 1979, Shibatani & Pardeshi 2001) and that change of state itself is likely a scalar notion that has important interactions with a verb's temporal properties (see e.g. Hay et al. 1999, Kennedy & Levin 2008, Beavers 2012), all of which have potential to constrain what a possible verb meaning is. The focus on templates in prior work is understandable — if templates predict most of the verb's grammatical and semantic properties then a theory of templates is fundamental to a theory of possible verb classes. Furthermore, it may seem fruitless to explore the truth conditions of lexical semantic roots in too much detail, where one might expect to find a myriad of fine-grained but linguistically uninteresting distinctions (as suggested by Fillmore 1970: 129 and Dowty 1979: 32). But as Dowty (1979: 125-126) notes, if we do not have a theory of what lexical semantic 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 lexical semantic root can have any meaning at all.

An obvious starting point for understanding the semantic contributions of templates and lexical semantic roots is the hypothesis that, parallel to their grammatical division of labor, there is a division of labor in their truth conditional contributions. In particular, the lexical entailments templatic operators introduce into a verb's meaning cannot be introduced also or instead by the lexical semantic root. On this view, lexical semantic roots only describe specific actions and states, and more complex meanings like change of state are built compositionally from independently justified processes of building event structures. This view has been argued for explicitly as Embick's (2009: 1) BIFURCATION THESIS FOR ROOTS, Arad's (2005: 79) ROOT HYPOTHESIS, and Dunbar and Wellwood's (2016: 10) NO CONTAINMENT CONDITION (see also Borer 2005, 2013).

(2) BIFURCATION THESIS FOR ROOTS: If a component of meaning is introduced by a semantic rule that applies to elements in combination [i.e. by templatic operators], then that component of meaning cannot be part of the meaning of a [lexical semantic] root.

It therefore follows in relation to 1 that because we can overtly see that entailments of change are introduced templatically in 1a,b, they are always introduced templatically whenever they are present, even in cases where it cannot be seen to be the case on the surface as in 1c.

Bifurcation is a strong hypothesis in predicting (im)possible word meanings and their grammatical correlates: all lexical semantic roots of the same semantic type (e.g. state-denoting) should by default occur in all the same templates, and the presence or absence of particular templatic meanings should correlate with a consistent set of regular grammatical properties since those meanings would have to be introduced by specific templates. Bifurcation thus predicts an exceptionally strong correspondence between the templatic meaning and grammatical behavior, essentially serving as the boundary case for such a correspondence. Of course, bifurcation is by no means a necessary assumption. Many works on verb meaning have rejected it to varying degrees. For example, Goldberg (1995: 59-66) and Rappaport Hovav and Levin (1998: 109) associate some lexical semantic roots or equivalent loci of idiosyncratic meaning with templatic meanings. Relatedly, Marantz (1997: 216-217), Ramchand (2008: 58), and Alexiadou and colleagues (2006: 202-203) divide lexical semantic roots into grammatical classes that ensure they must occur in certain templates, meaning some roots ensure certain templatic meanings even if not introducing those meanings themselves. Other works — certainly the majority — are simply silent on the issue. However, resolving the question of whether bifurcation holds is important for addressing the larger challenge posed by Dowty (1979: 125-126), and it remains an open question what evidence would decide the issue.

Beavers and Koontz-Garboden (2020) provide an explicit argument against bifurcation, at least in English. In one extended case study, they propose that the lexical semantic roots of some English change-of-state verbs entail change. In particular, they distinguish two types of lexical semantic roots for English change-of-state verbs: those that underlie deadjectival change-of-state verbs (Levin 1993: 245) like 1b, which do not entail change, and those that underlie the nondeadjectival change-of-state verbs like 1c, which do entail change.[1] Their argument is based on transparently distinct morphological properties of the two root classes in what adjectival forms are derivationally related to them as well as semantic evidence suggesting that lexical semantic roots underlying verbs like 1b are disassociable from entailments of change while lexical semantic roots underlying verbs like 1c are not. These results argue against bifurcation, thus leaving still unresolved an answer to the challenge to event structural approaches raised by Dowty.

However, Beavers and Koontz-Garboden's study is restricted to English, and as we show the English patterns could amount to a few language-particular assumptions analyzable in a way consistent with bifurcation that could undermine their conclusions. In this paper we present two cross-linguistic studies that confirm their analysis and argue against an English-specific analysis. First we consider entailments of change in change-of-state verbs in several (mostly) unrelated languages and use standard tests for isolating lexical semantic root meaning, including sublexical modification à la Dowty (1979: 252-254, 260-269), von Stechow (1995, 1996, 2003), Marantz (2009) and cross-categorial entailment patterns, as used by Beavers and Koontz-Garboden for English. We show that lexical semantic roots with related meanings across languages tend to fall into classes akin to those of English deadjectival and nondeadjectival change-of-state verbs, with lexical semantic roots of the latter class entailing change, in contrast with those of the former class. We couple this with a typological study of the morphological patterns of stative and eventive forms associated with these lexical semantic roots. We show that in a balanced sample of languages lexical semantic roots in the two classes contrast in the kinds of stative forms associated with them: translations of stative terms corresponding to the lexical semantic roots of English deadjectival change-of-state verbs tend to have simple forms while those corresponding to nondeadjectival change-of-state verbs lack them. Similarly, translations of deadjectival change-of-state verbs tend to be derived from more basic statives while translations of nondeadjectival change-of-state verbs tend to be morphologically simple. In other words, lexical semantic roots akin to those found in English deadjectival change-of-state verbs tend to be lexicalized as basic statives while those that underlie nondeadjectival change-of-state verbs tend to be lexicalized as basic verbs. The simplest analysis is that lexical semantic roots can entail change owing to facts about the real-world states they describe, and this can affect the morphological forms the roots occur in. Thus the strong correlations of semantics to grammatical properties bifurcation predicts do not hold.

In §2 we recap event structural approaches, discussing different formalizations and which aspects of the research program are relevant here. In §3 we review and expand Beavers and Koontz-Garboden's argument that the lexical semantic roots of English change-of-state verbs fall into two classes, and consider whether this is a confluence of quirks of English or reflects a deeper fact that some lexical semantic roots entail change. In §4 we give semantic evidence for an equivalent distinction in other languages, and in §5-§7 we outline a typological study showing a morphological contrast between the same two lexical semantic root classes across languages. Taken together, the recurring distinctions between the two types of lexical semantic

[1] 'Deadjectival' is meant descriptively, related to asymmetrical surface markedness. In event structural approaches the only necessary claim about related forms is that they represent different event structures with a shared lexical semantic root. Any specific derivational relation is a matter of specific analyses.

roots indicate a larger cross-linguistic trend, supporting an analysis by which some lexical semantic roots entail change, which figures into surface word morphology. In §8 we recap an analysis of these facts and consider alternatives that maintain bifurcation, and in §9 we discuss the implications of our study for broader questions in event structures and the value of the crosslinguistic methodology we have employed.

2. A BRIEF RECAP OF EVENT STRUCTURES. Event structures have been formalized in different ways, albeit always preserving the same key insights (see Beavers & Koontz-Garboden 2020: 8-23). In the tradition of Dowty (1979) (see also Levin & Rappaport Hovav 1995, Rappaport Hovav & Levin 1998, Wunderlich 1997, Van Valin & LaPolla 1997, Davis 2001, inter alia) a single morphological verb root is associated with a separate, complete event structure as part of its lexical entry, built from a set of templatic operators and a lexical semantic root. Thus *flatten* is associated with two event structures consisting of a state-denoting lexical semantic root FLAT combined with operators introducing cause and change, as in 3b,c. Conversely, activity *jog* is associated with an event structure consisting of a manner-denoting lexical semantic root JOG and some action-denoting templatic operator as in 3a.

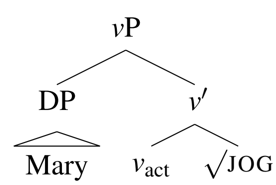
(3) a. Mary jogged. $\approx$ [Mary ACT$_{<\text{JOG}>}$]

b. The rug flattened. $\approx$ [The rug BECOME $<$ FLAT $>$]

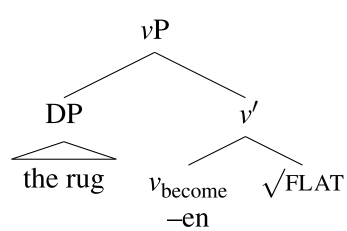
c. Mary flattened the rug. $\approx$ [Mary CAUSE [the rug BECOME $<$ FLAT $>$]]

Alternatively, some approaches treat event structures as phrase structures built from functional heads (e.g. light verbs of category *v*) that define the template and an idiosyncratic morphological root that defines the lexical semantic root, which together derive the surface morphological form (Marantz 1997, Embick 2004a, Harley 2012). Thus *flatten* is the surface realization of two phrase structures consisting of a state-denoting morphological root $\sqrt{\text{FLAT}}$ combined with *v*s introducing change and causation, as in 4b,c (loosely following Embick 2004a: 362, 365-366), whereas *jog* is the surface realization of a manner-denoting morphological root $\sqrt{\text{JOG}}$ modifying an action-denoting *v* as in 4a.[2] (We ignore structure introducing tense and grammatical aspect.)

(4) a.

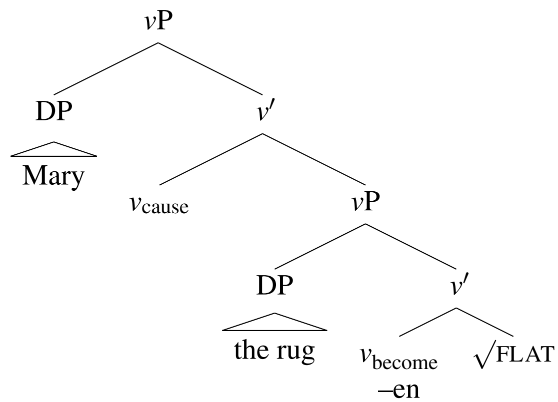


b.



[2]In some approaches the morphological root is also treated as acategorial, as represented in 4, and the surface stem's category is instead determined by functional heads. Nothing at all that we say here or below hinges on this.

c.



Regardless of implementation, many facts about verb meanings and verb classes can be made to follow. First, the surface verb's truth conditional content is determined by the interpretation of the lexical semantic root, the templatic operators, and how they are combined. Furthermore, each template predicts that the given verb belongs to some semantic class (action, change-of-state, caused change-of-state). Different verbs in each class have the same templates but different lexical semantic roots describing different actions or states. A lexical semantic root can also occur in multiple templates (e.g. $\sqrt{\text{FLAT}}$ occurs in 4b and 4c plus stative templates defining adjectives, and equivalently for 3b,c). Assuming that by default the lexical semantic root's denotation is the same across these templates, this results in shared idiosyncratic semantics. When event structures are treated as phrase structures, a correspondence between the template and the surface verb's grammatical properties follows directly: the *v*s 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. 4a is an activity, 4b an achievement, and 4c an accomplishment; Dowty 1979: Ch.2), and capture analytic relationships between verbs with shared morphological roots (e.g. 4c entails 4b since the latter embeds the former). The morphological root's primary job apart from introducing idiosyncratic meaning is to determine the verb's idiosyncratic morphology, though some approaches also posit that the root may have syntactic features or other properties that ensure it occur in only certain templates, thus indirectly influencing the grammar (see Marantz 1997: 216-217, Harley 2005, Levinson 2007, Ramchand 2008: 58 and Alexiadou et al. 2006: 202-203).[3]

For lexicalist event structures as in 3 the same facts can be captured through correspondence rules between the verb's event structure and its grammatical properties, such as conditions ensuring that the highest argument in the event structure is realized as the highest argument in the verb's syntactic projection and that verbs with BECOME have appropriate morphology, among others (see e.g. Levin & Rappaport Hovav 1995: 20-30, Rappaport Hovav & Levin 1998, Wunderlich 1997, Van Valin & LaPolla 1997: 102-129). For present purposes the only noteworthy difference between lexicalist and syntactic approaches is that in the lexicalist approach the surface morphological root corresponds to the entire event structure, which contains a lexical semantic root, whereas in the syntactic approach the morphological root is conflated with the lexical semantic root and the event structure is a larger phrase structure. But regardless of how the morphological pieces are related to the semantic components, both theories posit a distinction between templatic and idiosyncratic semantic components for each verb, and the resulting event structures define broad verb types with shared grammatical properties, with idiosyncratic variation within each type.[4]

In what follows we will be interested in what, for a given event structure associated with a given

[3]That $\sqrt{\text{JOG}}$ describes an action and $\sqrt{\text{FLAT}}$ a state already suggests templatic meaning in lexical semantic roots, though this is alternatively a type-theoretic issue about what types of eventuality arguments each takes as per Levinson (2007), a distinction we also assume though our interests are on the truth conditions imposed on those eventualities.

[4]Approaches may also mix lexicalist and nonlexicalist assumptions (e.g. if inchoatives are verbs but causativization is syntactic). Alternatively, some approaches (e.g. Pinker 1989, Jackendoff 1990) do not make an ontological distinction between templates and

change-of-state verb, the lexical semantic root contributes, and whether it ever introduces change. For this we assume event structures are interpreted compositionally, with lexical semantic roots denoting states. Crucially, our goal is not to figure out what the lexical semantic root meaning is in some more abstract sense divorced from the event templates we are interested in. The 'same' lexical semantic root may have different meanings in different templates (assuming that, barring irregularity, shared morphological roots indicate shared lexical semantic roots), meaning the lexical semantic root itself is polysemous or reflects some conceptual 'bundle' of meaning (as in the Distributed Morphology variant of event structures; see §8). However, at least for change-of-state verbs and their related statives we assume by default that the lexical semantic root has the same denotation unless there is good reason to posit otherwise, so as to capture the common paradigmatic fact that the change-of-state forms describe changes into the states denoted by the stative forms.

Finally, for concreteness it is useful to have a specific framework of analysis. We adopt the syntactic event structures in 4 since they provide an expositorily clean way to describe a compositional semantics, though the nitty-gritty particulars of any given syntactic approach are not relevant to us. Since we adopt a framework that conflates morphological and lexical semantic roots the term 'root' could refer to either notion, though our focus is on lexical semantic roots regardless of whether they are morphological roots, and this is what we mean by the term 'root' going forward. We stress that bifurcation is statable in ANY event structural framework, and our conclusions apply equally to all of them. The key point is that while event structural approaches posit an ontological distinction in roots vs. templates as parts of a theory of verb meaning, there is no truth conditional difference that distinguishes them of the sort bifurcation would predict.

3. TWO TYPES OF ENGLISH CHANGE-OF-STATE VERBS.

3.1. PROPERTY CONCEPT VS. RESULT ROOTS. Building on a distinction first outlined in Dixon 1982: 50 (see also Megerdoomian 2002: 90-102, Alexiadou & Anagnostopoulou 2004, Koontz-Garboden 2006), Beavers and Koontz-Garboden (2020: 58) call the roots of deadjectival change-of-state verbs as in 5 PROPERTY CONCEPT (PC) ROOTS (following the terminology of Thompson 1988: 168), since they describe Dixon's basic properties dimension, age, color, value, among others. The roots of nondeadjectival change-of-state verbs as in 6 are RESULT ROOTS (presaging the ultimate analysis), which form change-of-state verbs having to do with physical damage, cooking, killing, among others. The items we have chosen for our study in 5 are those Dixon claimed are most often lexicalized as adjectives across languages (i.e. the most canonical statives), and those in 6 are chosen from Levin (1993) for having meanings likely to have translation equivalents across languages, to facilitate our crosslinguistic studies. The terms are given in their verbal and adjectival forms (with synonyms/hyponyms in parentheses).[5]

(5) Property Concept Roots

a. DIMENSION: large/big/enlarge, small/shrink/shrunken, short/shorten, long/lengthen, deep/deepen, wide/widen, tall/high/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

lexical semantic roots. However, the distinction still arises as an emergent property between shared vs. nonshared aspects of the event structures of verbs in a class, and thus it is still possible to theorize about the distinction. See Beavers and Koontz-Garboden (2020: 8-22) for a discussion of different types of approaches.

[5]A 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.

e. PHYSICAL PROPERTY: cool/cool, cold/make cold, warm/warm, hot/heat up, dirty/dirty, dry/dry, wet/wet, 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

(6) 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

h. VERBS OF INHERENTLY DIRECTED MOTION: come/came, gone/go, go in (entered/enter), go out (exited/exit), returned/return

In §§3.2-3.4 we review a variant of Beavers and Koontz-Garboden's (2020: Ch.2) argument that English terms like those in 5 and 6 differ in the morphological forms of adjectives associated with each type of root and the entailment patterns of the relevant adjectives and verbs. In §3.5 we extend this argument to the verbal morphological forms. A simple analysis is that result roots entail change, and thus bifurcation does not hold. However, there are ways to analyze the English data consistent with bifurcation, though they involve certain coincidences that would only be plausible if they were quirks of one particular language. Showing that the patterns recur in other languages will argue against a language-particular analysis and support one based on something deeper.

3.2. DISTINCT STATIVE FORMS FOR PC AND RESULT ROOTS. One simple prediction of bifurcation is that change-of-state verb roots should show all the same overt morphological forms. Any exceptions should be due to (a) narrow subclasses of roots that have unique morphological properties for reasons compatible with bifurcation or (b) lexical idiosyncrasy. We first consider stative forms, which in English are typically adjectives. PC roots generally show two adjectives: a simple one as in 7a and a superficially deverbal one as in 7b.

(7) a. Look at the bright picture on your left.

b. Look at the brightened picture on your left.

Embick (2004a: 364-368) analyzes these two forms as the same root occurring in two adjectivalizing contexts: combining directly with a adjectivalizing templatic head Asp_S as in 8a, or combining with a v_become (FIENT, in Embick's terms) and then an adjectivalized Asp_R as in 8b.

(8) a. BASIC STATES (cp. Embick 2004a: 364, (23)): $[_\text{AspP}\ \text{Asp}_\text{S}\ \sqrt{\text{ROOT}}\ ]$

b. RESULT STATES (cp. Embick 2004a: 367, (29)): $[_\text{AspP}\ \text{Asp}_\text{R}\ [_{v\text{P}}\ \text{DP}\ v_\text{become}\ \sqrt{\text{ROOT}}\ ]\ ]$

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 7b, examples of which are given in 9.

(9) baked, bent, bloomed, broken, burned, cooked, creased, crushed, decayed, drowned, fermented, folded, fried, melted, roasted, rusted, shattered, sprouted, swollen, torn, etc.

There are few simple adjectives corresponding to 7a (an exception being suppletive *dead*∼*kill*). Yet under bifurcation, any stative root should appear in either of 8, producing two distinct adjectives. Embick (2004a: 358) claims, however, that the roots of 9 do appear in both of 8, but with result roots both $\mathrm{Asp_S}$ and $\mathrm{Asp_R}$ are overtly realized as *–ed/en* while with PC roots $\mathrm{Asp_R}$ is realized as *–ed/en* while $\mathrm{Asp_S}$ is null. In other words, 9 are structurally ambiguous between the two types of adjectives. This is considered an accident of English: there just happen to be two root classes regarding surface morphology, a reasonable analysis if this were the only distinction between PC and result roots. However, we show there are additional, complicating contrasts.[6]

3.3. THE SEMANTICS OF PC AND RESULT ROOT STATIVE FORMS. The analysis in 8 also predicts that simple PC adjectives will not entail change but deverbal PC adjectives will, since only 8b contains v_{become}. 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 but not deverbal PC adjectives are acceptable when change is denied (judgments here and below are of the native speaking coauthors of this paper plus others we consulted; Embick 2004b: 356-360 and Beavers and Koontz-Garboden 2020: 62-65 give additional tests and data supporting this point):[7]

(10) a. The bright/#brightened photo has never brightened.

b. The red/#reddened dirt has never reddened.

Thus PC roots do not entail change, which instead comes from certain templates.

The analysis in 8 also predicts that result root adjectives should not entail change, since they are ambiguous between 8a and 8b and in any context could be interpreted as 8a. 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).

(11) a. #The barbecued chicken has never barbecued.

b. #The cooked chicken has never cooked.

c. #The shattered vase has never shattered.

However, a reviewer asks if the unacceptability of 11 is due to lack of context. In particular, we have not clarified what it means to be described by a deverbal adjective other than to have undergone an action described by the verb, and hearers may by default assume the reading is the truly deverbal one. Crucially,

[6] A reviewer notes while PC roots but not result roots have zero-related adjectives, result roots but not PC roots tend to have zero-related nominals (e.g. *a burn* but not **a large* on the intended sense). This is a very interesting observation, but unfortunately one we cannot address here as nominals will take us too far afield.

[7] A potential objection (following Embick 2004a: 357, fn.1) is that deverbal adjectives are ambiguous between adjective (qua stative) and passive (qua eventive) readings, which cannot be disambiguated in attributive position. Thus perhaps the uses in 10 are all eventive, accounting for the contradiction without appeal to v_{become}. However, as Beavers and Koontz-Garboden (2020: 64, fn.8) discuss in more detail, on this analysis stative participles should be possible here as well since simple adjectives are, incorrectly predicting that 10 should be acceptable (plus, replacing the attributive deverbal adjectives with relative clauses formed from predicative adjectives shows the same results).

this objection presupposes that such a state can be identified, which is not a fully justified assumption. It is possible that some states may only be defined as arising from a change and thus there is no 'pure' state, as Beavers and Koontz-Garboden suggest (see §3.6).

If we were to entertain some more basic state in 11 that can be divorced from the change, what would it be? As Beavers and Koontz-Garboden (pp. 66-67) note, the likeliest answer is that it would be whatever conditions would lead one to assume a change described by the verb occurred even if it had not (in a reviewer's terms, the action's 'prototypical' result). Thus, were an artist to make a set of ceramic pieces that, when properly assembled, formed a vase, if *shattered* denotes just a state otherwise identical to the result of *shatter* these pieces should be a shattered vase. Yet in such a context 11c is still infelicitous, and similar attempts to rescue 11a,b also do not help. Thus result root adjectives generally entail change, suggesting they cannot be analyzed as in 8a.

We now briefly mention two classes of potential counterexamples. The first are so-called derived statives (Nedjalkov & Jaxontov 1988, Koontz-Garboden 2010), where a deverbal adjective occurs in a context without a prior event of change.

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

However, this is not evidence of a 8a-type structure. First, an apparently non-change-of-state usage of this root also occurs with truly verbal forms (e.g. *The line breaks several times across the page*). Thus *broken* in 12 could be derived from this sense of the verb. Second, while there is no temporal change in 12, it is well known that change-of-state verbs can have atemporal uses (Langacker 1986, Matsumoto 1996, Sweetser 1997, Talmy 2000: Ch.2), with recent formal analyses treating these as change along spatial scales (Gawron 2006, Koontz-Garboden 2010), or even nonspatial scales such as populations (Deo et al. 2011, 2013). *Broken* in 12 describes change across space — moving right to left along the page there is a line, then a gap, then a line, over and over. One of the major results of work on nontemporal change is that temporal and nontemporal change are essentially the same notion, differing only in the axis of measurement. It is thus a fallacy to conclude that examples like 12 do not entail change. Going forward, we ignore the distinction between temporal and nontemporal change for simplicity and focus just on the former.[8]

However, for some speakers some result root deverbal adjectives formed from result roots do not entail change even absent an obvious spatial reading. For example, several speakers (including a reviewer) have told us *broken* applied to physical artifacts does not entail change, such that 13 should be acceptable.

(13) The window is broken but it never broke. It was manufactured that way.

Yet, as Beavers and Koontz-Garboden (2020: 71-73) discuss, variation in the interpretation of particular adjectival forms among both simple and derived adjectives is actually expected owing to lexical drift or idiosyncratic semantic factors. Among deverbal forms, even if the default analysis is 8b, once a given adjective has become lexicalized it could undergo semantic drift to describe states that lack change (losing the structure in 8b despite having its form). Such mismatches are known in prior literature: seemingly deverbal *closed* does not entail undergoing a closing, since something can be built in that position (Embick 2004a: 357-358), a reading we suspect all speakers allow. *Broken* for some speakers may have taken on a 'not functioning' meaning. Similarly, earliest attestations of (historically deverbal) *dead* in the OED refer to the cessation of life functions, but for speakers who accept *My phone is dead. It never worked*, *dead* may have also taken on a 'not functioning' meaning. (See Dowty 1979: 309-319 on lexicalization in event structural frameworks.)

[8]A reviewer suggests that *break* in 12 'is not the same lexeme as *broken* in the sense of 'fractured or damaged'. We disagree; the point of the literature on atemporal change is that temporal and atemporal change cases can be reduced to the same sense. On the assumption that this is the case, that *broken* in 12 requires change over space shows that it cannot be analyzed as in 8a, the only question relevant here.

Conversely, simple PC adjectives could entail change even in 8a if the root itself entails change. *Old* may be a case of this, where to be old one must have first been young or new. (According to the OED, *old* is historically derived from the past participle of Old English verb *alan* 'nourish', which may explain this entailment.) Alternatively, simple adjectives could undergo lexical drift to entail change. Additionally, there could be speaker-to-speaker variation on what readings are possible (giving rise to differing judgments), or language-to-language variation on how related meanings are lexicalized (see §4.1 and §4.5). However, our goal is to show that bifurcation does not hold, and for this it is sufficient to identify at least some roots that defy it for some speakers even if judgments vary across roots or speakers. The examples here and below show this is the case.

In sum, adjectival forms of many result roots entail change, something not explained under bifurcation if they are ambiguous between the two structures in 8. We can maintain bifurcation by treating this as another fluke of English: perhaps result roots always occur only in the superficially deverbal adjectival structure 8b and never the basic one in 8a, for example they have a syntactic feature requiring them to always cooccur with v_{become} (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.

3.4. 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, 14 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 v' as in 14a and 14b respectively.

(14) Mary flattened the rug again, and it had been flat/flattened before.

a. [$_{v\text{P}}$ Mary [$_{v'}$ v_{cause} [$_{v\text{P}}$ the rug [$-en_{v_{\text{become}}}$ [$\sqrt{\text{FLAT}}$ again]]]]] (restitutive)

b. [$_{v\text{P}}$ Mary [$_{v'}$ [$_{v'}$ v_{cause} [$_{v\text{P}}$ the rug [$-en_{v_{\text{become}}}$ $\sqrt{\text{FLAT}}$]]] again]] (repetitive)

Bifurcation predicts this: on the restitutive reading *again* scopes over only a root and roots describe simple states, so it is the simple state that occurred before. PC roots allow both readings, for example 14 and 15 all allow restitutive and repetitive readings. (In 15 we give contexts clarifying a restitutive reading, which is the main reading that will ultimately be of interest to us.)

(15) 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 four 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 four hours.]
The producer lengthened the film again. (could be just one lengthening)

However, result roots lack restitutive readings, having only repetitive readings (Rappaport Hovav 2010: 7 and Beavers & Koontz-Garboden 2012: 358). This is shown in 16 by incompatibility with contexts requiring a restitutive reading (e.g. a prototypical result context as per §3.3).[9]

[9]Consistent with §3.3, speakers who find particular result root verbs to allow participial forms that do not entail change may also find restitutive readings possible, for example *Sandy closed the door again* has a restitutive reading in the context of restoring something to a 'built closed' state (Dowty 1979: 252, (31)). A reviewer finds *thaw again* to have such a reading (contra Rappaport Hovav 2010: 7 and our own judgments) as well as *return again*. The same reviewer does find restitutive readings unacceptable with *melt*, *shatter*, and *fry*. As noted above, such variation is expected.

(16) a. [Chris kills a rabbit, takes it home, skins and butchers it, puts the fresh meat in the freezer for a week, and then takes it out and puts it on the table to thaw.]
#Chris thawed the meat again. (necessarily two defrostings)

b. [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)

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

This is difficult to reconcile with bifurcation. *Again* should be able to target the root, deriving a restitutive reading. We could posit a syntactic feature preventing attachment to result roots, forcing *again* to attach higher and deriving a repetitive reading, though it is unclear what would motivate this.[10] We now turn to a prediction of bifurcation not discussed by Beavers and Koontz-Garboden.

3.5. VERBAL MARKEDNESS 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.[11] However, English PC root verbs are often marked (i.e. deadjectival) as in 17a (governed largely by phonology, with *–en* surfacing mainly after nonnasal obstruents; Jespersen 1933). Conversely, result root verbs are usually unmarked (i.e. basic verbs) as in 17b (see also Koontz-Garboden 2005: 88-90).[12]

(17) a. wid**en**, whit**en**, straight**en**, stiff**en**, short**en**, **en**large, hard**en**, 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 §3.2 or verbal here.

However, 17 is just the inverse of the situation in §3.2, where PC but not result roots form unmarked adjectives. We could save bifurcation in a manner parallel to 8 by positing two verb templates, one including a null v_{become} and the other Asp_{S} and v_{become}, realized as *–ed/en*:[13]

(18) a. BASIC VERBS: $[_{v\text{P}}\ v_{\text{become}}\ \sqrt{\text{ROOT}}\ ]$

b. DERIVED VERBS: $[_{v\text{P}}\ v_{\text{become}}\ [_{\text{AspP}}\ \text{Asp}_{\text{S}}\ \sqrt{\text{ROOT}}\ ]\ ]$ (cp. 8)

If we assume as in §3.3 that result roots must compose first with v_{become} by virtue of some feature à la Alexiadou and colleagues (2006: 202-203) or Ramchand (2008: 58) this would rule them out occurring in

[10] An objection might come from reversative analyses of *again* that posit that *again* always attaches high and entails that the change under its scope is reversed (e.g. Deo et al. 2013, Pedersen 2014, Beck & Gergel 2015). Since *again* never scopes over a root it does not probe root meaning. However, it is unclear how such an analysis would derive a lack of restitutive readings with result roots without additional assumptions. Plus, Spathas (2017) shows that additive *also* and *too* show an ambiguity analogous to the repetitive vs. restitutive and require a scopal analysis, yet show the same PC vs. result root distinction (see §4.5 on Greek, though his English translations show the same patterns).

[11] One subregularity is whether the causative or inchoative is derived from 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, Schäfer 2009, Haspelmath et al. 2014, Lundquist et al. 2016, Schäfer & Vivanco 2016, inter alia). Our focus is just in whether there are distinct morphological patterns between PC and result root verbs more broadly.

[12] As per fn. 1 we use MARKED vs. UNMARKED to reflect a surface morphological asymmetry, where marked verbs appear to contain some other term (e.g. a stative) plus additional grammatical structure suggestive of derivation, whereas unmarked verbs do not, though we do not necessarily assume that any actual derivational process has occurred.

[13] One difference is that 8a,b but not 18a,b have a semantic correlate. This raises the question of what independently motivates 18. Our goal is not to fully defend this analysis, but to demonstrate a plausible analysis of 17.

18b and 8a but permit them in 18a and 8b. We could analogously posit that PC roots have a feature requiring them to compose first with Asp_{S} (though this requires a trivial modification of 8b so that the complement of v_{become} could be an AspP rather than just a root). This rules them out in 18a but permits them in 18b and both of 8. Together with the constraint that result roots have a feature requiring v_{become} we have in essence recreated the descriptive generalization that PC roots are lexicalized as adjectives and result roots as verbs. That roots would differ in this way could be treated as a morphological accident, essentially the two arbitrary root class analysis of Embick 2004a: 358, albeit defined by features rather than different spell outs of functional heads.

This analysis would also capture the entailment data, since PC roots can occur without v_{become} but result roots never will, guaranteeing that change is always entailed with the latter but not the former. It also opens up an analysis of the *again* data other than the one discussed in §3.4. If we assume *again* never scopes over roots but instead scopes over something larger than a root — presumably by some syntactic feature, since there is no semantic reason why this should be so — then for PC roots the lowest attachment would be AspP, allowing restitutive readings, but for result roots it would be be $v_{\text{become}}{}'$, ruling out restitutive readings since v_{become} would always be under its scope:

(19) a. $[_{vP}$ Mary $[_{v'}$ v_{cause} $[_{vP}$ the rug [*–en*$_{v_{\text{become}}}$ $[_{\text{AspP}}$ $[_{\text{AspP}}$ Asp_{S} $\sqrt{\text{FLAT}}$] again]]]]]

b. $[_{vP}$ Mary $[_{v'}$ v_{cause} $[_{vP}$ the rug $[_{v'}$ $[_{v'}$ *–en*$_{v_{\text{become}}}$ $\sqrt{\text{FLAT}}$] again]]]]

Thus an analysis consistent with bifurcation is possible, but requires making two purely syntactic assumptions about the roots that are not justified by anything deeper, plus one nonstandard assumption about how sublexical scope works. We summarize and evaluate the picture so far.

3.6. 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 while maintaining bifurcation means appealing to syntactic diacritics ensuring what templates each root occurs in, coupled with specific assumptions about sublexical modification. 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.

However, there is an alternative analysis that rests on a simple emergent generalization from the data above. Unlike the states described by PC roots, the states described by result roots are not disassociable from an entailment of change. Any time a word is formed from a result root, change is entailed. Thus perhaps the root itself introduces change. More specifically, as Beavers and Koontz-Garboden (2020: 80-90) propose, we could assume stative roots predicate a certain idiosyncratic state s for patient x.[14] Asp_{S} and Asp_{R} represent identity functions, while v_{become} introduces a further event e that is the coming about of s, represented by logical operator $become'$.

(20) a. $[\![\sqrt{\text{FLAT}}]\!] = \lambda x \lambda s[flat'(x,s)]$

b. $[\![\text{Asp}_{\text{S/R}}]\!] = \lambda P \lambda x \lambda s[P(x,s)]$

c. $[\![v_{\text{become}}]\!] = \lambda P \lambda x \lambda e \exists s[become'(e,s) \wedge P(x,s)]$

Combining $\sqrt{\text{FLAT}}$ with Asp_{S} will produce a pure stative, while combining it with v_{become} will introduce

[14]Here 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, using a typed λ-calculus.

change. Thus words formed from $\sqrt{\text{FLAT}}$ will only entail change depending on the template. Furthermore, if *again* scopes over just $\sqrt{\text{FLAT}}$ it will not have change under its scope.

But since result roots give rise to similar patterns regarding the nondeniability of change in contexts in which the state is asserted in §3.3 and in deriving repetitive readings under *again* modification in §3.4 that arise from v_{become} with PC roots, the most natural assumption is that result roots introduce the $become'$ themselves, which might be what Rappaport Hovav and Levin (1998: 109) mean in saying that *break* type verbs are built on 'result states' (see also Dixon 1982: 50). Beavers and Koontz-Garboden (2020: 216-224) suggest two reasons why this might arise. First, some states, like that inherent to the root of *crack*, might only be conceived of as arising via some change, so that it arises as an inference from asserting the state (e.g. by meaning postulate), as in 21a. Second, some states that do not require a change might be so conventionally associated with one that a root arises that lexicalizes change in combination with the state, as might be for the root of *melt*, which patterns like a result root (Rappaport Hovav 2010: 7; cp. *liquefy*), as in 21b.

(21) a. $[\![\sqrt{\text{CRACK}}]\!] = \lambda x\lambda s[cracked'(x,s)]$, where $\forall x\forall s[cracked'(x,s) \rightarrow \exists e'[become(e',s)]]$
  b. $[\![\sqrt{\text{MELT}}]\!] = \lambda x\lambda s[melted'(x,s) \wedge \exists e'[become'(e',s)]]$

Either way, change will be entailed whenever $\sqrt{\text{CRACK}}$ or $\sqrt{\text{MELT}}$ are used even absent a v_{become}, and scope of *again* over either will ensure prior change as well.[15] Accepting this analysis, though, requires rejecting bifurcation, and with it the strong syntax/semantics correlation it predicts.

Crucially, assuming some consistency across communities in how certain states are conceived of or in how they conventionally arise, if Beavers and Koontz-Garboden are right we would expect that across languages similar states will be described by roots that pattern consistently in terms of their semantic properties, which may in turn feed morphological splits across roots in different classes. Of course, we also expect to see variation in particular items across languages or speakers within a language since it is unlikely that the exact same meanings will be lexicalized in the exact same ways, as seen above. Nonetheless, commonalities of human experience would lead to the expectation of consistent violations of bifurcation across languages. Conversely, if we adopt the alternative hypothesis in §3.5 that hinges on formal features of English roots and sublexical modifiers, we would not expect the same distinctions to recur across languages, or if they do it would not necessarily manifest in the same way with equivalent roots. Thus were the data above unique to English and bifurcation was otherwise motivated it might militate for the analysis 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 being described would be more plausible.

We show that the asymmetries between English PC and result roots are found across languages, suggesting a deeper and more systematic generalization. The goal is not to show that translation equivalents across languages always pattern identically. We expect language-particular variation as well as speaker-to-speaker variation, as above. Rather, we show that these patterns are attested in other languages in ways that reflect a recurring trend. We first look at the semantics in a small sample of languages before turning to a broader typological study of their morphology.

4. SEMANTICS. To verify that the semantic patterns obtain crosslinguistically 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 §3.1. 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 2017b, 2018), Hebrew (Semitic, Afro-Asiatic), and Marathi (Indic, Indo-European). The goal is not to show that

[15] This analysis is similar to that of Kratzer (2000: 390-391) for the roots of German target state participles, which contrast semantically and syntactically with a separate class of participles she claims are formed from deadjectival verbs. However, the differences found between the two classes of German participles do not translate to the PC vs. result distinction, although the fact that Kratzer posits a class of roots in German with this meaning independently confirms that bifurcation does not hold in a second language; see below for further examples.

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.

4.1. KAKATAIBO. Kakataibo statives are adjectives while inchoatives and causatives are verbs, two distinct categories (see Valle Arevalo 2017: 69-72, 74). Simple statives and inchoatives are usually labile (i.e. the same surface stem), with causatives generally formed by causative *–o* (though some inchoatives are derived from the causative, and in some cases both are derived from a separate shared form). Result statives are formed by factive *–kë*. This is illustrated in 22 (see Valle Arevalo et al. 2017).[16]

(22)

LANGUAGE	ROOT	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
Kakataibo	large	*ani*	*ani*	*ani-o*	*ani-kë/ani-o-kë*
Kakataibo	wrinkle	—	*churi*	*churi-o*	*churi-kë/churi-o-kë*

Valle Arevalo and colleagues (2017) examined the PC terms *xo paxada* 'yellow', *ani/cha* 'big', *upi(t)* 'pretty, beautiful', *tuna(n)* 'black', *uxu(a)* 'white', *inru* 'hard', *xana* 'hot', *bata* 'sweet', *bachu* 'soft', *ˈaidama* 'bad', *bënsi(t)* 'thin', *xëni* 'old', *chadkë(t)* 'long', *chabat* 'wet', *puntë(t)* 'straight', *diba(t)* 'smooth', *kacha* 'sour', *anacha* 'wide', *chukúma(t)* 'small', *mamúa* 'round', *ëd-ki-kë* 'dry-INTR-NMLZ' and the result terms *tëa-kë* 'cut-NMLZ', *nën* 'burn', *a-ru-kë* 'do-UP-NMLZ' "cook", *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'. Simple PC statives as in 23a do not entail change, but derived PC statives as in 23b do, where the form derived from a caused change-of-state verb cannot be asserted while also denying the caused change of state.[17]

(23) a. báinka ani ˈikë ˈaibika uini abi ni Diosabi ni
báin=ka=a ani ˈikë ˈai=bi=ka=a uini a=bi ni Diosa=bi ni
hill=VAL=3A/S big be.3.IMPF then=EMPH=VAL=3A/S INDF.PRO 3=EMPH nor God=EMPH nor
uni yubë unibi anioima.
uni yubët uni=bi ani-o-i-i=ma.
man sorcerer man=EMPH big-FACT-IMPF-PROX=NEG
'The hill is big, but nobody nor God nor a sorcerer made it big.'

b. #taíka puntëokë ikë aibika
tain=ka=a puntët-o-kë ikë ai=bi=ka=a
arrow.stick=VAL=3A/S straight-FACT-NFUT.NMLZ be.IMPF.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

[16] The 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=factitive, FEM=feminine, FV=final vowel, HANDS(8)=classifier, IMPF=imperfective, INCH=inchoative, INDF=indefinite, INTR=intransitive, INF=infinitive, ITR=iterative, M=masculine, N.PROX=nonproximate, 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.

[17] Valle Arevalo and colleagues (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.

'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:

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

Additionally, PC roots generally allow restitutive readings under iterative *-tëkën* marking as in 25a, while result roots usually resist them as in 25b (though again it is sometimes difficult to figure out exactly what the relevant state would be divorced from the change leading to it).

(25) a. [The desert starts off dry. Then, it is made nondry. Then it turns dry again.]

madin papanka ëdkitëkënia.
madi=n papa=n=ka=a ëd-ki-tëkën-i-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 sasakatëkënia/arutëkëa.
uni=n=ka=a nodi sasa-ka-tëkën-a-x-a/'a-ru-tëkën-a-x-a
man=A/S=VAL=3A/S banana 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, *rëtë* 'kill' allows restitutive modification, as with an inanimate brought to life by magic and then killed.

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

maxákana rë(të)tëkëa.
maxat=ka=na rëtë-tëkën-a
stone=VAL=1A/S kill-again-PRFV

'I killed the stone again.'

Such variation is expected; not all translation equivalents are perfectly synonymous. A simple analysis for 26 is that the root of *kill* means 'dead', which can only apply to living entities that have undergone a dying, while *rëtë* means 'not alive', which allows inanimates that were simply never alive. On balance, result root translations that also entail change exist in Kakataibo, while PC root translations do not seem to have entailments of change.

4.2. KINYARWANDA. Kinyarwanda shows something similar (Jerro 2017b, 2018). In Kinyarwanda the simple state, inchoative, and result state are usually all labile. Various patterns relate this labile form to the causative: the causative is also labile, it is derived equipollently or from the labile form via causativizing *–ish/–esh* (Jerro 2017a), or else the labile form is derived from an unmarked causative by detransitivizing *–ik/ek*, the latter common among result roots and the others among PC roots.

(27)

LANGUAGE	ROOT	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
Kinyarwanda	sharp	*gu-tyara*	*gu-tyara*	*gu-tyaza*	*gu-tyara*
Kinyarwanda	break	—	*ku-men-ek-a*	*ku-mena*	*ku-men-ek-a*

While statives and inchoatives are labile verbs, tense/aspect inflection provides disambiguation, where (roughly) past + perfective and present + imperfective are purely inchoative while present + perfective combinations are stative (see Jerro 2017b, 2018). Given this, PC stative *gu-tyara* 'sharp' entails no change (and similarly for *nini* 'large/enlarge', *umutuku* 'red', *–re–re* 'long') while result root stative *gu-teka* 'cook' does (also *gu-shongesha* 'freeze (harden)', *ku-mena* 'break', *gu-subiza* 'return', *gu-ca* 'tear', *gu-hanuka* 'fall'). Only the former is possible in contexts where the state always held, even if a context is clarified that pulls out an approximation of the state described by the verb divorced from change (and even with the modifier *–hora* 'always', which ensures the state always held when combined with a perfective verb).

(28) 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, only PC roots permit restitutive readings with *–ongera* 'again', but not result roots.

(29) 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 nondissociable from a change.

4.3. 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).

(30)

LANGUAGE	ROOT	UNDERLYING	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
Hebrew	large	*g-d-l*	*gadol*	*gadal*	*hi-gdil*	*mu-gdal*
Hebrew	break	*š-v-r*	—	*ni-šbar*	*šavar*	*šavur*

Once again, 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/mu'arax* 'long/lengthened$_{\text{V}}$/lengthened$_{\text{Adj}}$' (and similarly for *xad/xided/mexudad* 'sharp/sharpened$_{\text{V}}$/sharpened$_{\text{Adj}}$', *gadol/higdil/mugdal* ‘large/enlarged$_{\text{V}}$/enlarged$_{\text{Adj}}$’, *xazak/xizek/mexuzak* ‘strong/strengthened$_{\text{V}}$/strengthened$_{\text{Adj}}$’, *tov/šiper/mešupar* ‘good/improved$_{\text{V}}$/improved$_{\text{Adj}}$’).

(31) ha-gesher ’arox/#mu’arax ’aval ’afpaʕam lo hu’arax/hit’arex.
the-bridge long/lengthened but never NEG lengthened.PASS/lengthened.REFL
‘The bridge is long but (was) never lengthened.’

Statives related to result root change-of-state verbs categorically entail change as with *nipec/menupac* ‘shattered$_{\text{V}}$/shattered$_{\text{Adj}}$’ (and similarly for *nafal/naful* ‘fell/fallen’, *hexzir/muxzar* ‘returned$_{\text{V}}$/returned$_{\text{Adj}}$’, *šavar/šavur* ‘broke/broken’, *bišel/mevušal* ‘cooked$_{\text{V}}$/cooked$_{\text{Adj}}$’).

(32)#ha-zxuxit menupecet, ’aval hi ’afpaʕam lo hitnapca.
the-glass shattered, but it 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 *mexadaš* (literally ‘from new’), the latter of which generates only restitutive readings (similar to English *re*– prefixation; see Dowty 1979: 256).

(33) a. [A film producer makes a four 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 four hours.]

ha-mefika he’erixa šuv/mexadaš ’et haseret
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/mexadaš ’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.

4.4. MARATHI. Marathi simple states are largely adjectives, with verbs either derived from the adjectives (morphologically/periphrastically) 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).

(34)

LANGUAGE	ROOT	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
Marathi	long	*lāmb*	*lāmb-ɳe*	*lāmb-əv-ɳe*	*lāmb-əv-lele*
Marathi	melt	—	*vitəɭ-ɳe*	*vitəɭ-av-ɳe*	*vitəɭ-lele*

PC vs. result roots show the expected entailment contrast, as with *lāmb/lāmb-av-ɳe/lāmb-av-lele* ‘long/long-CAUS-INF/long-CAUS-PART’ “long/lengthen/lengthened” vs. *phoɖ-ɳe/phoɖ-lele* ‘break/shatter-INF/break/shatter-PART’ “break/shatter/broken/shattered” (also for *rikāme/rikāme kər-ɳe/rikāme ke-lele* ‘empty/empty make-INF/empty make-PART’ “empty$_{\text{Adj}}$/empty$_{\text{V}}$/emptied”, *tsāngle/tsāngle kər-ɳe/tsāngle ke-lele* ‘good/good make-INF/good make-PART’ “good/improve/improved”, *dhār-dār/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”, *moʈhe/moʈhe kər-ɳe/moʈhe ke-lel* ‘large/large make-INF/large make-PRT’ “large/enlarge/enlarged” vs. result *vitaɭ-ɳe/vitəɭ-lele* ‘melt-INF/melt-PART’ “melt/melted”, *pərət-əv-ɳe/pərət-əv-lele* ‘return-CAUSE-INF/return-CAUSE-PART’ “return/returned”).

(35) a. chitrəpəʈ lāmb/#lāmb-əv-lelā āhe āɳi 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 phoɖ-leli āhe pəɳ ti kədhi
glass.NOM.F.SG shatter.TRAN-PART.F.SG be.PRES.3.SG but DEM.F.SG ever
phuʈ-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.

(36) 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 phoɖ-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.

4.5. 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 fn. 10, this comes from the interpretation of additive modifiers. Among change-of-state verbs, those in 37a 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 37b allow only the equivalent of a repetitive reading, where both the expressed patient and some other entity underwent the same change.

(37) 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.

(38) 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 37a 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 37b 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.

4.6. SUMMARY. Across several 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 §3 is not purely coincidental in English but likely due to some deeper connection. We now consider whether the corresponding morphological distinctions between PC and result roots also recur.

5. MORPHOLOGY: BASIC METHODOLOGY. To explore the morphology 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. We look first at the existence of simple stative forms, where the expectation from §3.2 is that PC roots should have more simple statives than result roots. We then look at verbal markedness, where the expectation from §3.5 is that PC roots will have more marked verbs than result roots.

Our primary 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 Nedjalkov 1969, Nedjalkov and Silnitsky 1973, Haspelmath 1993, Nichols and colleagues 2004: 157, Brown 2013a,b, Nichols 2018: 4). The root meanings we examined are the 36 PC and 36 result root meanings in 5 and 6 in §3.1. 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 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).

We collected simple state and result state forms of each root, plus both possible eventive forms, the causative and inchoative. In at least some languages some of these forms were based off of some separate shared morpheme (e.g. a bound morpheme as in Hebrew per §4.3, or perhaps a nominal base). We referred to this morpheme as the UNDERLYING ROOT and collected data on those as well. We refer to the set of these five items as the PARADIGM for the root (though, as a reviewer notes, this is a potentially nonstandard use of the term 'paradigm'; we mean nothing by it save how we have defined it here). Example paradigms for English √RED and √SHATTER are given in 39.

(39)

LANGUAGE	ROOT	UNDERLYING ROOT	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
English	red	—	*red*	*redden*	*redden*	*reddened*
English	shatter	—	—	*shatter*	*shatter*	*shattered*

In looking for equivalents to 5 and 6 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 (e.g. valency processes, parts of speech, (de)verbalization) and relevant morphophonological processes, and then do bidirectional dictionary searches to capture the full range of meanings of each term according to the resources (using also relevant data found in the grammatical resources). Certain coauthors were responsible for certain global regions under the assumption that they would become familiar with regional linguistic tendencies and scholarly traditions. For any language X a researcher began with the metalanguage-to-X section. This was used to direct them to specific words in the X-to-metalanguage section; navigating the forms and filling in the paradigm was primarily done from the X-to-metalanguage side. The researcher also kept notes on relevant aspects of the morphological composition of various forms (e.g. if it contains an overt causative affix).

For stative terms we looked for forms used in predicative constructions, including possessive predicational strategies in languages that utilize those (Francez & Koontz-Garboden 2015). The category of the stative did not matter. As Dixon (1982) showed statives can be adjectives, verbs, or nouns depending on the language. We were just interested in whether a form existed.[18] Similarly, certain category features were not relevant, such as agreement, tense, and grammatical aspect. Here we followed the resource regarding such features, for example if the datum came from an example sentence we kept the features of the attested form, or we used whatever citation form a dictionary provided. Thus in Murrinh-Patha the causative for 'crush' is *mam-lerrkperrk* '1SGS.HANDS(8).NFUT-crush' "crush" with agreement, a verbal classifier, and tense plus the lexical stem (taken from Seiss 2013: 79, (3.14a)), whereas in Spanish all verbs are in citation (infinitive) form. Finally, we treated synonyms as a root meaning associated with multiple paradigms.[19]

We furthermore coded each item X for its morphological relationship to each form Y_k ($1 \leq k \leq 5$) in its paradigm by assigning X a 5 character code in the following order.

(40)

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 41, a generalization over those in Haspelmath (1993: 90-92).

(41) 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.

[18] A reviewer asks if verbal simple statives in languages like Kinyarwanda (§4.2) could have consequences for exploring morphological relationships. Indeed, Koontz-Garboden (2005, 2007a) suggests that a single word can be polysemous between a state and a change of state sense just in case it is a verb (as opposed to an adjective or noun). We do not believe this impacts on our results, however. If the question is whether a stative word exists the category does not matter. If the question is whether the verbs are marked relative to the corresponding simple stative, here the inchoative would of course be unmarked. However, as we show below, only PC roots tend to have simple statives, so this will be seen only with PC roots. This would go against the expectations from §3.5 that PC root verbs are *more* marked than with result roots. Yet as we show below the broad pattern from §3.5 is nonetheless attested across languages. Excluding cases with verbal statives would thus only make the difference between PC and result root verbs more stark. Therefore not taking categoryhood into account causes no harm, and is the most conservative position.

[19] In addition to the methodology outlined above, for eight languages (boldfaced in §A) we were able to get data directly from native speakers. For languages like Tzeltal, where we had access to a native speaker consultant (typically a linguist), the researcher first explained the study's goals and methodology, and then filled out several of the property concept and result root paradigms with the consultant. Once the consultant understood the task, they filled in the rest of the paradigms on their own and then met with the researcher again in order to review the paradigms and revise any cells that the consultant was unsure of. In a few cases a fieldworker collected the data in a field collection environment, in which case they were given leeway to use whatever elicitation techniques matched their standard methodologies. Finally, for three languages we collected the data from a resource as above and then checked it against a native speaker.

f. u - X and Y_k are unrelated (no above relation applies).[20]

g. n - Y_k is unattested.

h. s - X is Y_k

We based the coding on surface grammatical relationships, unless a grammar or dictionary was quite explicit on a morphological relationship not obvious from the surface forms (though this rarely if ever came up). When coding the forms the researcher noted their rationale for directionality (e.g. noting causative/inchoative morphs, rooted in information from the grammatical resources). Two sample fully coded paradigms are given in 42, one from Tzeltal (collected from a native speaker) and one from Oromo (collected from grammatical and dictionary resources). Here the Tzeltal inchoative for 'become 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.

(42)

LANGUAGE	ROOT	UNDERLYING ROOT	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
Tzeltal	small	—	*tut*	*tut-ub*	*tut-ub-tes*	*tut-ub-en*
		—	nsitt	ndsii	ntdse	ntdes
Oromo	long	*dheer-*	*dheer-aa*	*dheer-addh*	*dheer-essuu*	—
		siiin	dseen	desen	deesn	—

Finally, for analytical purposes we made assumptions about what to do with paradigms for which we had no data, incomplete data, or too much data (i.e. synonymous forms). We ignored any root meaning in any language for which we had no data for any part of the paradigm, on the assumption 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 Anejom̃, so we assumed we had a gap in the resources). But if we had at least one attested paradigm member, we treated any missing items as nonexistent forms.[21] Conversely, if a root meaning corresponded to several apparent synonyms then for any given analysis we selected one synonym at random. In all, we ended up with 3,368 PC and 3,500 result roots with data, for a total of 6,868 paradigms and a total of 34,340 possible forms. Of these 15,127 cells ended up filled with data found in one of the ways described above (there were also 2,957 hypothetical forms, ignored here; see fn. 21). Once one synonym is chosen per synonym set there are 2,712 PC roots and 2,417 result roots with data, with the exact number of cells filled depending on which random synonyms were chosen.[22]

6. THE EXISTENCE OF SIMPLE STATIVE FORM.

6.1. THE NONEXISTENCE OF SIMPLE STATIVE FORMS FOR RESULT ROOTS. We first consider whether PC roots are more likely to have simple stative terms than result roots, as expected from §3.2. Previous

[20]This covers what Haspelmath (1993) meant by 'suppletive', which he used for the relationship between paradigm pairs like *kill* and *die* that are not labile nor is there any clear surface derivation between them or from something else, and pairs like *die* and *dead* which are historically related but not derived through any synchronically productive means.

[21]One potential objection arises from the possibility that even though a form was unattested it could be derived from attested forms using derivational processes. Indeed, in some agglutinating languages such as Kiowa dictionary resources did not give full paradigms, but instead only roots and rules. This raises the possibility that quite a number of the unattested forms actually exist, which might impact on our results (though of course we cannot be sure which will). To account for this possibility, when we found partially attested paradigms and had grammatical resources that said that specific productive processes existed for producing missing members we constructed forms based on those processes but marked them with the diacritic @ to indicate that they were hypothetical. We then ran all of our statistical tests again with hypotheticals included. This did not change any of our results, save in one worst case scenario condition (see §7.3 for details). We thus ignore hypotheticals going forward. For more details see the supplemental files.

[22]To show that choosing random synonyms does not skew our results, we repeated our statistical tests in a Monte Carlo setting, 1,000 runs with hypotheticals, 1,000 without, picking a random synonym from each set in each repetition. The resulting distributions showed our results to be unaffected by synonym choice (see the supplemental files).

studies suggest an absence of simple states for result roots in other languages (on Eastern Armenian see Megerdoomian 2002: 92, on Ulwa see Koontz-Garboden 2007b: 183, on Tongan see suggestive data in Koontz-Garboden 2005: 92-94, on O'odham see Hale & Keyser 1998: 92, on Pima see Smith 2006: 3, on Kakataibo see Valle Arevalo et al. 2017: 6-8, on Kinyarwanda see Jerro 2017b: 14-15). Our own data confirm these prior observations. After excluding root meanings in any language for which we had zero attested data, we treated a simple stative as existing if we had a form for it. The general pattern seen in 42 was dominant, and a statistical analysis confirms this. We assigned to each root meaning the percentage of languages for which a simple state form was attested just in case we had some data for that root (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 Table 2 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 = 95.67%, result median = 1.59%, $U = 1266.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).[23]

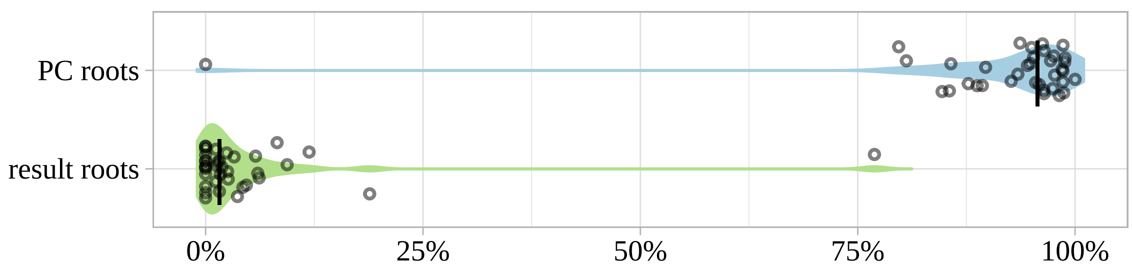


FIGURE 1. Percentage of Languages With Underived States by Root Class Coded by Translation

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

[23]In 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 Gaussian kernel density estimation), and vertical bars indicate distribution medians. To compare PC and result root distributions, we employed the nonparametric Mann-Whitney test over the more conventional t-test since many of our distributions — notably those in Fig. 1 — are nonnormal. The Mann-Whitney test is useful for producing intuitive visualizations of the different distributions of the two types of roots, but it is also possible to test directly for the effect of root class on the existence of the stative term using a generalized linear mixed model with a binary response variable. Nothing changes about the results under this alternative for any tests here or below. We refer the reader to the supplementary files for a full description.

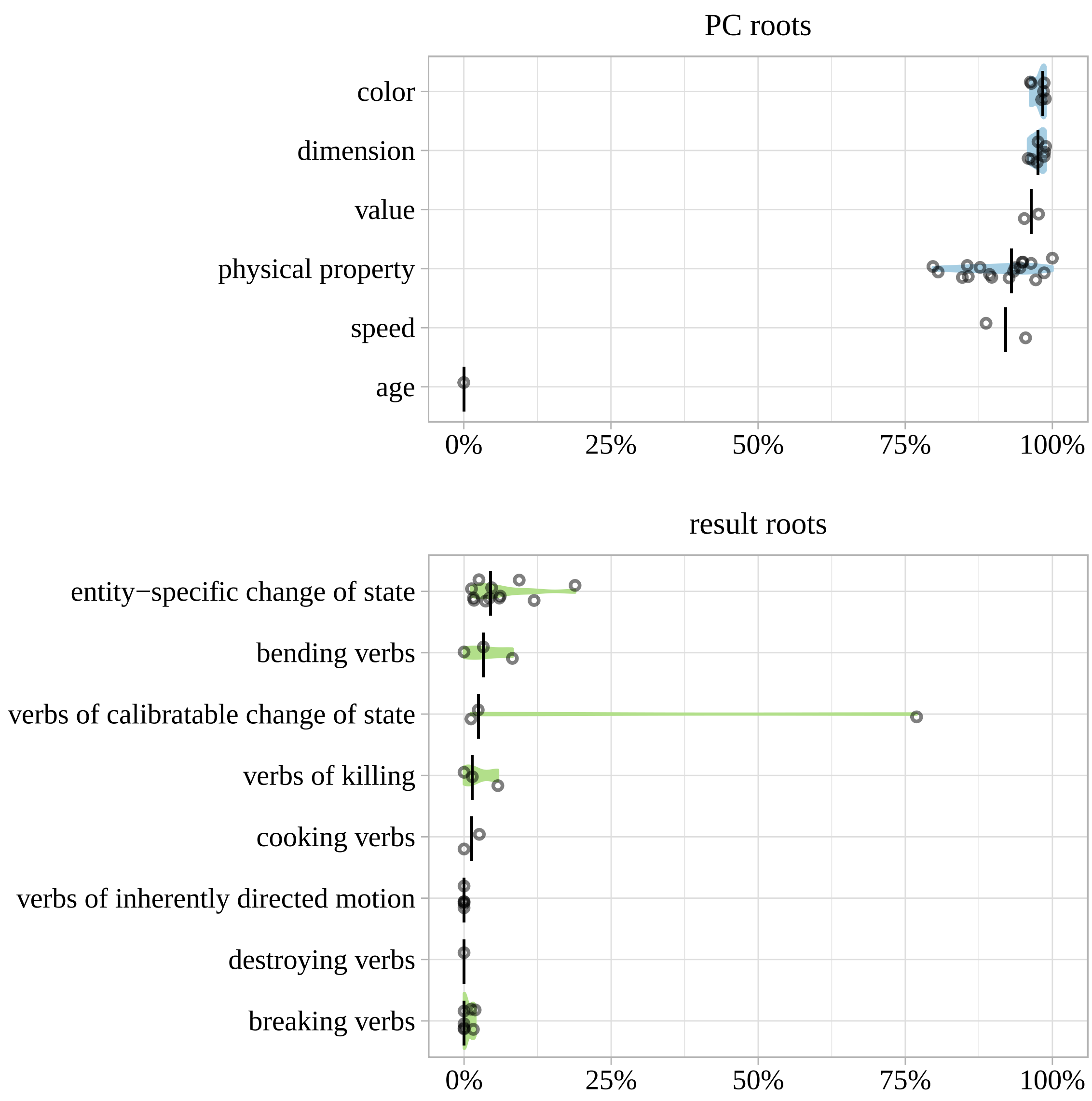


FIGURE 2. Percentage of Languages With Underived States by Root Subclass Coded by Translation

There are two exceptions. First, age roots pattern like result roots rather than PC roots. This follows from an observation from §3.3 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 by virtue of our coding choices. 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.[24]

[24] A further problem is that *differ* has a stative use implying no change, and thus translations to it might be stative and not eventive (see also fn. 5). Perhaps it should be excluded from the analysis, though we left it in for completeness.

6.2. POTENTIAL TRANSLATION AND CATEGORY BIAS. A potential objection is that some stative terms translating as English result roots might have semantically simple stative meanings, but since there is no corresponding simple English 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 $\sqrt{\text{BREAK}}$ has no English translation equivalent, so the author uses *broken* as the closest equivalent. This would introduce translation bias into the data when translation is used as a proxy for semantics. The question is how we can identify possible translation bias. One way to do this would be to use morphology as a clue. For example, the standard assumption (see §§1-3) is that if there is a derivational relationship between a simple stative term and the rest of the paradigm the simple state should be the most basic, with the result state form likely derived from the verbal forms. Of course, it need not be this way. But this is the most iconic pattern and thus expected to be the most common when there is a derivational asymmetry at all. Thus if we found stative terms translated as result states but morphologically unmarked relative to the rest of the paradigm this might be a clue (albeit not a definitive one) that that term was mistranslated.

We thus performed a second test wherein we reclassified result state terms as simple state terms if it was the input to, equipollent to, or labile with any other form in the paradigm. In other words, the only statives we called result states were those translated as result states and also clearly 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 = 95.61%, result median = 27.66%, $U = 1293$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

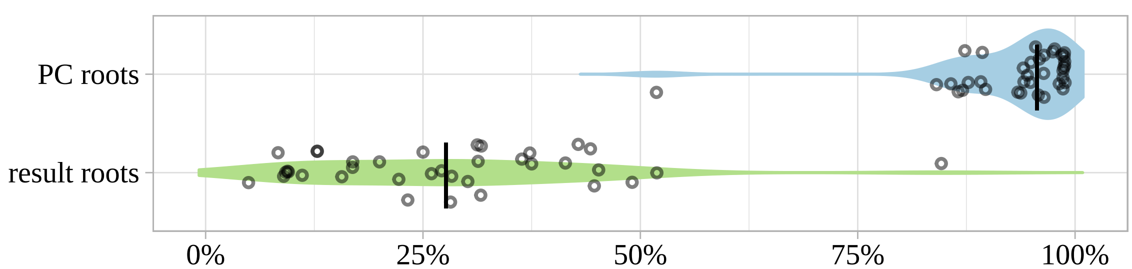


FIGURE 3. Percentage of Languages With Underived States by Root Class Coded, Correcting for Morphology

The breakdown by subclasses is given in Fig. 4.

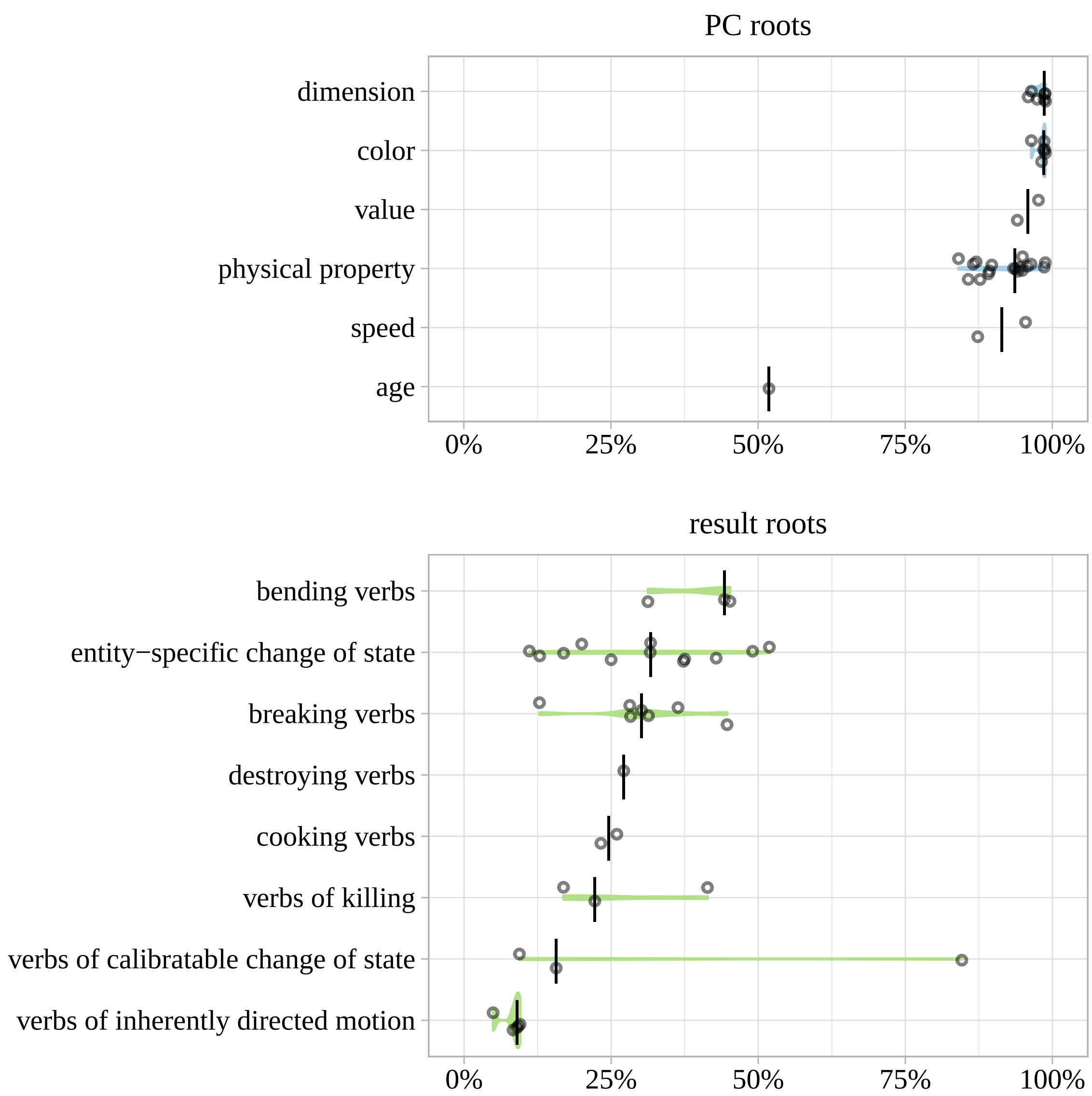


FIGURE 4. Percentage of Languages With Underived States by Root Subclass Coded, Correcting for Morphology

The generalization remains that statives based on result roots do not exist in the morphological forms those based on PC roots do, no matter how simple states are ultimately identified. The former but not the latter tend to lack simple stative forms.

A second potential objection is category bias: as a reviewer notes, the categories from English (or whatever the metalanguage is for a given language resource) may influence what translation is given, for example (de)verbal forms are likely to be translated as (de)verbal forms. However, it is not clear that this would be the case. First, it is generally known that crosslinguistically translation equivalents may be of different categories, as demonstrated by Dixon (1982) in showing that stative terms that might be adjectives in one language surface as verbs and nouns in others. Furthermore, the reclassified data referenced in Fig. 3 provide suggestive evidence against category bias in our dataset. Comparing Fig. 3 to Fig. 1 the reclassification increased the median number of simple states for result roots considerably, whereby for about a quarter of the result roots a deverbal stative form was translated as something that was not obviously deverbal. While some of these may be simple stative verbs, it is unlikely all are, again suggesting that there may not be category bias. For example, in Hopi (Uto-Aztecan) the term *aavu* translated as deverbal 'decayed, rotten' is a simple adjective which consists of just a root (Hopi Dictionary Project 1998: 14). The same is true of Vietnamese *bˆė* which is listed as a nondeverbal adjective translated as deverbal 'broken' (Nguyễn 1967: 173). Both forms serve as the respective inputs to the *aavu-ti* 'decay, rot', for Hopi, and *bi bˆė* 'break (intransitive)' (Nguyễn 1967: 172) and *đập bˆė* 'break (transitive)' (Nguyễn 1967: 171) for Vietnamese. In sum, there is no reason to assume any form of category bias.

7. PREFERENCES FOR MARKED VS. UNMARKED VERBAL FORMS.

7.1. A FIRST PASS: USING ONLY COMPLETE VERBAL PARADIGMS. The second question is whether eventive members of the paradigm of a given root were marked. The expectation if PC and result roots differ as in §3.5 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 (e.g. if one is derived from the other; see fn. 11), we took the question to be whether either of the verb 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 unrelated relationships and thus was coded as unmarked. If we had two verbs we coded the combination of the two verbs — which we refer to as the root's VERBAL PARADIGM — as marked iff both verbal forms are marked. If the verbal paradigm had one attested unmarked verb we coded it as unmarked regardless of the coding of the other verb or even whether it is attested (since one unmarked verb is sufficient to say the entire verbal paradigm is unmarked). However, a question arises of what to do for verbal 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 §7.3 for alternative assumptions). Comparing the distribution of marked verbal paradigms among PC and result roots under this assumption (see Table 3 in §B for the root percentages) PC roots had significantly more marked verbal paradigms than result roots as in Fig. 5 (PC median = 56.01%, result median = 15.20%, $U = 1291$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

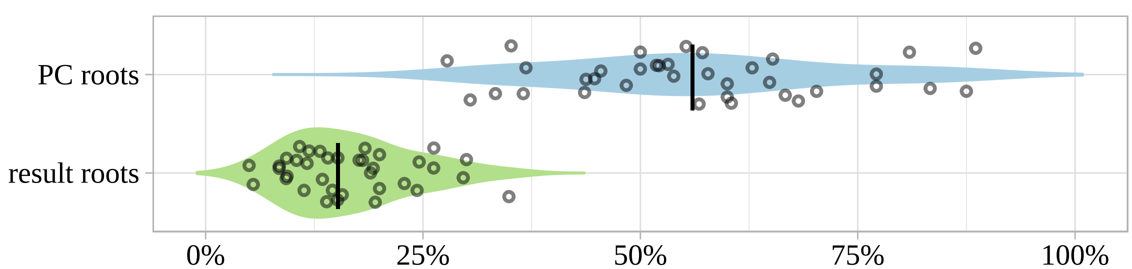


FIGURE 5. Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms

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

7.2. RELATIONSHIP OF VERBAL MARKEDNESS TO LANGUAGE TYPE. Taking a more qualitative view of the data, some interesting (though impressionistic) subregularities emerge that show that the tendency in §7.1 plays out in different ways and to varying degrees contingent on idiosyncratic language-internal facts, including a language's basic typological profile. Consider Table 1. The first two columns for each language represent the number of PC and result root verbal 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

	# 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	*Koiari*	5	20	40.00	5.00	0.12
Paumarí*	2	10	50.00	100.00	2.00	Greek (Modern)	22	44	59.09	6.82	0.12
Navajo*	18	18	66.67	94.44	1.42	Vietnamese	31	35	87.10	8.57	0.10
Kakataibo†	59	64	23.73	31.25	1.32	Tenango Tzeltal	34	40	76.47	7.50	0.10
Gújjolaay Eegimaa*	31	26	80.65	88.46	1.10	Russian	37	40	83.78	7.50	0.09
*Oneida**	9	11	44.44	45.45	1.02	*Martuthunira*	6	19	100.00	5.26	0.05
Burushaski†	16	49	6.25	6.12	0.98	Swahili	36	42	50.00	2.38	0.05
Hebrew (Modern)*	35	42	100.00	97.62	0.98	Yup'ik	14	30	71.43	3.33	0.05
Arabic (Egyptian)*	24	40	100.00	90.00	0.90	*Georgian*	9	34	66.67	2.94	0.04
Paiwan	14	20	92.86	80.00	0.86	English	43	60	46.51	1.67	0.04
Cree (Plains)*	16	52	62.50	50.00	0.80	Spanish	34	36	88.24	2.78	0.03
Acholi	24	40	70.83	55.00	0.78	*Alamblak*	2	10	50.00	0.00	0.00
Berber (Middle Atlas)*	26	44	73.08	54.55	0.75	Barasano†	19	31	10.53	0.00	0.00
Tagalog*	14	30	57.14	40.00	0.70	Burmese†	28	49	3.57	0.00	0.00
Yagua†	34	53	14.71	9.43	0.64	*Chamorro†*	11	34	9.09	0.00	0.00
Hausa	27	28	59.26	35.71	0.60	French	46	41	69.57	0.00	0.00
Malagasy	8	22	100.00	59.09	0.59	Khoekhoe†	12	53	8.33	0.00	0.00
Oromo (Harar)*	17	17	94.12	52.94	0.56	*Koasati†*	10	30	30.00	0.00	0.00
Finnish	56	48	96.43	54.17	0.56	*Meithei*	4	40	50.00	0.00	0.00
Pintupi	14	26	85.71	46.15	0.54	*Mixtec (Chalcatongo)*	10	38	60.00	0.00	0.00
Yaqui	11	38	45.45	23.68	0.52	Mocoví†	16	34	25.00	0.00	0.00
Persian	14	35	57.14	25.71	0.45	Otomí†	46	74	15.22	0.00	0.00
Lakhota†	10	24	10.00	4.17	0.42	Quechua (Huallaga)	18	44	38.89	0.00	0.00
Kwoma†	10	25	10.00	4.00	0.40	*Tiwi†*	9	20	11.11	0.00	0.00
Korean	16	45	43.75	15.56	0.36	Yoruba	40	97	40.00	0.00	0.00
Hindi	19	51	47.37	15.69	0.33	Zulu†	29	46	13.79	0.00	0.00
Japanese	18	45	83.33	26.67	0.32	Anejom̃†	17	35	0.00	0.00	—
Khalkha	34	26	85.29	26.92	0.32	Bariai†	12	39	0.00	0.00	—
Guaraí†	13	43	7.69	2.33	0.30	*Chukchi†*	4	19	0.00	0.00	—
Kayardild	6	22	100.00	27.27	0.27	*Daga†*	5	23	0.00	4.35	—
Karok†	7	28	28.57	7.14	0.25	*Fijian*	0	19	—	5.26	—
Basque	27	35	70.37	17.14	0.24	*Gooniyandi*	0	10	—	0.00	—
Warao	14	23	71.43	17.39	0.24	Indonesian†	19	47	0.00	6.38	—
Carib	13	19	92.31	21.05	0.23	*Jakaltek*	0	24	—	0.00	—
Turkish	39	43	79.49	16.28	0.20	*Kannada†*	8	33	0.00	9.09	—
Mapudungun	27	25	40.74	8.00	0.20	*Kewa†*	5	34	0.00	0.00	—
Tsimshian (Coast)†	7	37	14.29	2.70	0.19	*Kiowa†*	1	8	0.00	0.00	—
Dani (Lower Grand Valley)	2	22	100.00	18.18	0.18	*Koyraboro Senni†*	4	26	0.00	0.00	—
Zoque (Copainalá)	27	32	51.85	9.38	0.18	*Lezgian†*	8	27	0.00	3.70	—
Hawaiian†	10	57	10.00	1.75	0.18	*Murrinh-Patha†*	4	24	0.00	0.00	—
Hopi	23	40	86.96	15.00	0.17	Oksapmin†	16	35	0.00	0.00	—
German	36	30	97.22	16.67	0.17	*Rama†*	5	18	0.00	0.00	—
Huitoto (Minica)†	11	43	27.27	4.65	0.17	Sango†	30	60	0.00	0.00	—
Mandarin	23	56	73.91	10.71	0.14	*Thai†*	10	54	0.00	1.85	—

TABLE 1. Languages Sorted by Ratio of Markedness of Result Root (RR) Verbal Paradigms vs. PC Root Verbal Paradigms (boldface = much more marked RR verbal paradigms than PC root paradigms, italics = low data language, † = low verbal marking language, * = high marking language)

the percentage of marked PC and result root verbal paradigms respectively. The final column represents the ratio of the percentage of marked result root verbal paradigms to marked PC root verbal paradigms, by which the languages are ranked high to low.[25] A ratio around 1.0 indicates parity of marked PC and result root verbal paradigms, a ratio well above 1.0 indicates more markedness among result root than PC verbal paradigms, and a ratio well below 1.0 indicates more markedness among PC than result verbal paradigms. The expectation from §3.5 is that languages should show a ratio well below 1.0. This is overwhelmingly the case, suggesting that the expectations from §3.5 are broadly borne out. 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 Table 1) show much more verbal markedness among result roots than PC roots, counter to expectation. These are all explained by a combination of linguistic typological factors plus idiosyncrasies of particular languages.

First, there are reasons to not consider the four boldfaced languages counterexamples. Consider first Paumarí, for which 100% of result root verbal paradigms were marked but only 50% of PC verbal paradigms were. However, it is clear there is a data problem — there are only two sufficiently complete PC verbal paradigms whereas there are 10 for result roots. Furthermore, the morphological paradigm in Paumarí is

[25]Some languages showed zero marked PC verbal paradigms, and thus the ratio cannot be computed; we notate this as '—'. However, in these cases the percentage of marked result root verbal 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 §7.3.

resoundingly equipollent, based on shared bound roots.

(43)

LANGUAGE	ROOT	UNDERLYING ROOT	SIMPLE STATE	INCHOATIVE	CAUSATIVE	RESULT STATE
Paumarí	tough	*dakha-*	*dakhaki*	*a'dakhaki*	*bina'dakhaki*	—
Paumarí	break	*dan-*	—	—	*bi'danivini*	*a'daniki*

Yet one of the two PC verbal paradigms happened to involve an unrelated causative and no underlying root (*sapasapaki* 'wide', *bavi bini'avini* 'widen'), thus skewing the results. A more natural view of Paumarí is that all verbal 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 Table 1.

Navajo, like Paumarí, relies heavily on equipollence, and as such there is a high degree of marking in PC and result root verbal paradigms. However, a few have unrelated verbs and there are slightly more among PC roots than result roots, with six out of 18 (33.33%) vs. one out of 18 (5.55%) respectively. Kinyarwanda has almost twice as many marked result verbal paradigms as PC verbal paradigms. But as noted in §4.2 Kinyarwanda relies 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 root verbal paradigms only three were (9.09%). So the ratio likely represents a fluke — one more marked PC verbal paradigm would have put the ratio at nearly 1.0. Finally, as discussed in §4.1, Kakataibo is also largely a labile language, but equipollence is a notable subpattern. The marked verbal 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. Regardless, though, the bigger point still stands: even if these were genuine counterexamples the overwhelming pattern in Table 1 is that result roots show marked verbal paradigms far less than PC roots, as expected.

Typological characteristics also correlate with further trends. Seven languages have numerous marked members in both PC and result root verbal paradigms at rough parity (e.g. a ratio between 1.1 and .80). Crucially, in our sample five 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 10 languages marked by a * in Table 1 are those in which 66.66% or more of all pairs of forms within each paradigm in our data set are related equipollently or based on an underlying root (see Table 4 in §B for all data used to classify languages typologically). Interestingly, all are found near the top of Table 1 (i.e. those where the relative marking was close to parity with much marking). The near perfect correlation with equipollent systems and higher 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 nonderivational relationships explain other languages at parity. These include languages like Kinyarwanda and Kakataibo, which rely significantly on labile relationships between verbs and statives, and languages like Yagua, which relies on unrelated pairs, accounting for nearly all unmarked PC verbal paradigms (e.g. stative *jamuca–* 'long' vs. causative *ratya* 'lengthen'). The 35 languages marked by a † in Table 1 exhibit low degrees of verbal markedness, defined here (somewhat arbitrarily) as having 33.33% or fewer marked paradigms among both PC and result roots. Three occur amongst the languages with parity or above near the top of Table 1, while most fall at the bottom of the list with so little verbal marking that the ratio is a parity of near 0.00, or uncalculable. These include some languages, like Murrinh-Patha, Anejom̃, Sango, and Otomi, that rely on labile or unrelated pairs for 66.66% or more of relationships between all pairs of forms within each paradigm in our data, and some languages that rely heavily on labile simple state/inchoative pairs (Burmese, Chukchi, and Indonesian) or a mix of labile and unrelated relations (Barasano, Khoekhoe, Zulu). That said, some low marking languages were also overall low data languages, making it hard to discern a pattern. 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 languages, and the vast majority of these thus show a parity (close to 1.00 if the few cases of marking happen to be at parity but generally close to 0.00), with a few spread out in between depending on how the numbers of the few marked verbal paradigms fell out. In sum, wholesale typological characteristics can obscure the result vs. PC root verbal markedness distinction, and language particular idiosyncrasies or quirks of the data may result in unexpected patterns (for more see §8). Otherwise, when the distinction does emerge it strongly patterns as expected from §3.5.

7.3. ALTERNATIVE TREATMENTS OF INCOMPLETE VERBAL PARADIGMS. Our results above ignore data where we cannot definitively tell from the attested verb forms whether the verbal paradigm is marked or not. But in the absence of a complete verbal 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 an extant stative or verbal form (e.g. via light verbs meanings ‘become’ or ‘cause’). In this case any missing verbal forms can be assumed to be marked, that is 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 = 79.16%, result median = 24.60%, $U = 1293$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

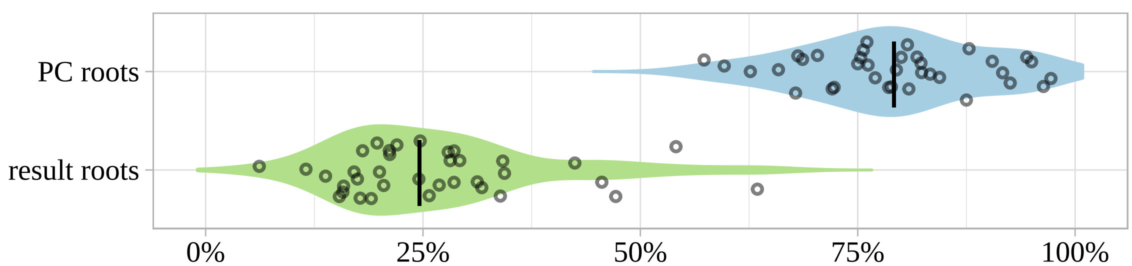


FIGURE 6. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked

A second alternative would be that missing forms are unmarked, for example if 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 = 24.12%, result median = 14.10%, $U = 1152$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

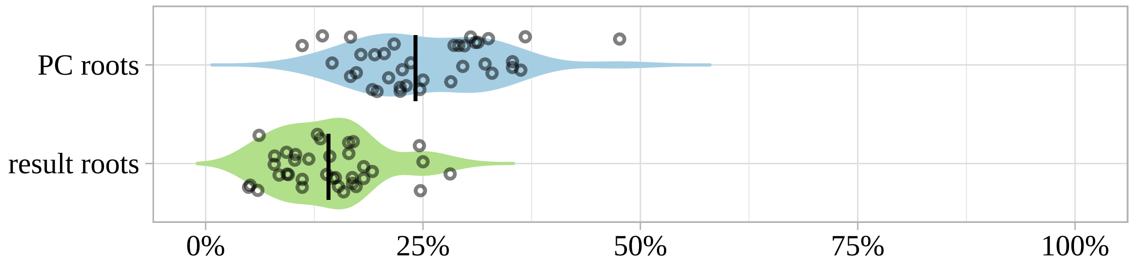


FIGURE 7. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked

Finally, we could assume the worst case scenario for the expectations from §3.5: missing PC verbs are unmarked and missing result root verbs are marked, in other words PC roots pattern the way we expect result roots to and vice versa (Fig. 8). It is only on this assumption that the null hypothesis that the two distributions are no different cannot be rejected (PC median = 25.14%, result median = 24.19%, $U = 686.5$, $n_1 = n_2 = 36$, $p = 0.33$ one-tailed). However, given the implausible assumptions made about unattested data this is not surprising. Conversely, though, result roots do not come out significantly more marked than PC roots despite the extreme bias ($p = 0.69$ two-tailed), reflecting again the significant difference between the two classes of roots in the attested data.[26]

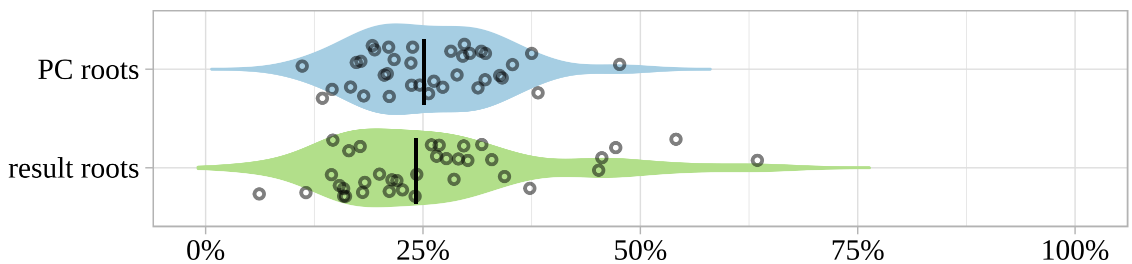


FIGURE 8. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked

7.4. 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 noncancelable inferences of change and PC roots do not. Thus the confluence of facts we saw in §3 are not just an accident of English, but represent a recurring pattern across languages.

[26]A reviewer wonders if the existence of languages in Table 1 classed as low data languages might be skewing the results, and suggests they could be excluded from the analysis. Similarly, the reviewer wonders if languages that rely on equipollent and labile/unrelated languages (i.e. that neutralize markedness) should not also be excluded. The particular definitions of these language categories given above are arbitrary, meant for illustrative purposes, and we are not sure what would be good cut offs for such languages. Furthermore, we believe it is more principled to include all data when we have it. However, we did rerun all of our tests with low data languages excluded and also with those two language types excluded, and nothing changed about the results, save that in both cases the test represented in Fig. 8 where we made worst case scenarios about PC vs. result root verbal markedness came out as PC roots verbs being significantly more marked than those of result roots. This was furthermore true when we left all of those languages in, but included hypotheticals. The most likely explanation for this is that the data set that excludes hypotheticals but keeps all languages in (a) contains more languages that go against the expectation on the surface owing to markedness neutralization and (b) has more data to extrapolate missing forms owing to the lack of hypotheticals and the inclusion of languages with sparser verbal paradigms. All this means the extrapolation has more room to push the data against the hypothesis.

8. DISCUSSION. In §3.6 we suggested that under bifurcation the correlating semantic and morphological facts of English are a confluence of language-particular syntactic assumptions. But if the patterns recur across languages a deeper explanation is more plausible, in which result roots but not PC roots describe states associated with a noncancelable inference of change, with the distinct morphological properties keyed to this. Since the patterns did recur, this is the preferred analysis.

In §3.6 we outlined the semantic analysis for English of Beavers and Koontz-Garboden (2020), which posits that the same notion of change introduced by v_{become} is part of the lexical entailments of result roots. If extended to other languages it would naturally explain all of the semantic facts discussed above. But what about the morphology? A simple analysis of the morphology of PC and result roots builds directly off the proposed semantic distinction. In the basic logic of event structural approaches change is typically introduced by verbal templates and not adjectival templates. Focusing just on English adjectives, Beavers and Koontz-Garboden (2020: 90) suggest that the default realization of English adjectival morphology ($\text{Asp}_{\text{S/R}}$ above) is null if its complement (a root or *v*P) entails no result and overt if it does. But taking the verbal markedness facts above plus the overall effect of language type into account, a significantly more generalized picture emerges.

Specifically, the forms that are unmarked when there is a markedness asymmetry are result roots as verbs and PC roots as adjectives (or some other stative category). But as categories verbs are canonical for descriptions of events of change, while stative categories are not. If result roots entail change and PC roots do not then the generalization is that each root derives an unmarked form within the template that most closely matches its meaning, and a marked one otherwise. We could capture this by adopting the default realizations $\text{Asp}_{\text{S/R}}$ and v_{become} in 44 (which apply as the elsewhere case in the absence of narrower lexical idiosyncrasies or specific subregularities), where $\text{U}_{\text{Asp}/v}$ refers to the form for the unmarked semantic association for the relevant category in a given language and $\text{M}_{\text{Asp}/v}$ for the marked association, where for each category if there is a morphological markedness asymmetry then $\text{U}_{\text{Asp}/v}$ is morphologically unmarked relative to $\text{M}_{\text{Asp}/v}$.

(44) a. Default realization of v_{become} with complement $\sqrt{\text{ROOT}}$:

i. If $\sqrt{\text{ROOT}}$ entails change, then U_v (result roots derive unmarked verbs)

ii. If $\sqrt{\text{ROOT}}$ does not entail change, then M_v (PC roots derive marked verbs)

b. Default realization for $\text{Asp}_{\text{S/R}}$ with complement X (root $\sqrt{\text{R}}$ or *v*P):

i. If X does not entail change, then U_{Asp} (PC roots derive unmarked statives)

ii. If X entails change, then M_{Asp} (result roots derive marked statives)

The English-type situation treats the unmarked forms as zero, and the marked forms as overt (in both cases *–en/ed*). Conversely, equipollent languages tend to realize most things overtly, that is they do not necessarily have an overt markedness asymmetry since most things are marked (relative to some underlying root or other paradigm member). In this case no markedness distinction would emerge in PC vs. result roots since the markedness distinction is independently neutralized. Equivalently, labile/unrelated languages tend to realize most things as zero, in other words they do not have an overt markedness contrast since most things are unmarked. In this case again the markedness distinction is neutralized. Thus in these two cases any effects of 44 would not surface even if it independently holds as a universal iconicity principle. The three main attested language types then are those discussed in §7.2 where there is a markedness asymmetry between PC and result root stative and eventive forms as in English, or where there is not either owing to everything being marked as in Hebrew or nothing as in Lakhota. The unattested type is the opposite of English, with marked statives entailing no change and marked verbs entailing change, predicted to not exist by 44.

More generally, cross-cutting 44 by a binary contrast between whether a language makes a markedness distinction or not produces the three broadly attested morphological patterns seen in §7.1 with no additional stipulation. This is superior to the analysis in §3.5 that is consistent with bifurcation. In that analysis the morphological facts are effectively superficial accidents of English that divide roots into two positively defined morphological classes plus additional assumptions about how sublexical scope works that would not be expected to recur in other languages. The rules in 44 alternatively have a deeper functional motivation, rooted in iconicty, and interact in the expected way with independent typological characteristics.[27] 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, and that grammars are sensitive to these similarities.

There are analyses other than the one in §3.5 that preserve bifurcation. However, they suffer from similar objections. For example, following the theory of allosemy in Myler (2014) and Wood and Marantz (2015) we could assume all stative roots describe simple states but must first combine with $\mathrm{Asp}_{\mathrm{S}}$ (even before v_{become}, i.e. all verbs are technically deadjectival). But $\mathrm{Asp}_{\mathrm{S}}$ is polysemous between an identity function 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 with PC roots) 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 trigger the same senses of $\mathrm{Asp}_{\mathrm{S}}$. Furthermore, it requires extra machinery to get all the facts right. In essence, just as with the analysis in §3.5, additional assumptions are needed to explain why this particular set of facts comes together across languages, relying on otherwise unmotivated distinctions 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 §2) that modify v_{cause}, with the state introduced by a functional head ST acting as the complement of v_{become}. This handles the cross-linguistic data if the state vs. manner root distinction holds up for roots describing equivalent meanings across languages. However, there is no evidence that all result roots entail manner. Rather, as Beavers and Koontz-Garboden (2012, 2020: Ch.4) discuss, some do and some do not. Furthermore, the analysis requires assumptions about the morphology — that these manner roots give rise to *–ed/en* statives in English when typically manner roots form *–ing* adjectives, and probably similar facts in other languages — 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).

A further alternative is suggested by a reviewer, specifically focused on Distributed Morphology, wherein root meanings are deemed to be a conceptual 'mush' rather than having a standard truth conditional denotation. On this analysis, PC roots denote states of the sort here and $\mathrm{Asp}_{\mathrm{S}}$ with them is the identity function, while result roots do not denote states but instead evoke event types. A special alloseme of $\mathrm{Asp}_{\mathrm{S}}$ takes them as input and outputs the prototypical result state for that sort of event. It is unclear how this analysis will explain speakers who get entailments of change with result root adjectives, but one way would be to say that the prototypical state has change as part of its meaning conceptually or by convention, as in §3.6. However, in this case the change is coming from the template, not the root, consistent with bifurcation, since the root does not have truth conditional content. While this analysis preserves bifurcation, it suffers from some several drawbacks. First, it requires positing a difference in the compositional contribution of PC vs. result roots that is not otherwise motivated other than to preserve bifurcation. In this sense the analysis is just a variant of the allosemic analysis above. Furthermore, the PC vs. result root distinction is again a type of formal distinction (e.g. a type-theoretic one), and it is unclear why it would replicate across languages. Interestingly, this analysis also uniquely posits not just that the templatic meaning comes from the template but that the idiosyncratic truth conditional content does as well, albeit contingent on

[27] However, 44 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; 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.

the specific root. That is, the meaning of $\mathrm{Asp_S}$ would have to include some function P that when applied to a root meaning r would produce the idiosyncratic truth conditions predicated of the patient, plus the entailment of change. In this sense the lexical semantic root meaning in the sense we are studying here — the locus of idiosyncratic truth conditional content — is part of the meaning of $\mathrm{Asp_S}$, thus being buried in the semantic representation of some other morpheme as per lexicalist analyses of event structures in §2. But it otherwise must itself entail change, essentially recreating the analysis we motivated above. On the nonbifurcated analysis the same results are achieved without making any additional assumptions and also maintaining a uniform compositional analysis. In sum, the nonbifurcated analysis simply posits that some states come with associated entailments of change and that morphology is sensitive to this in functionally natural ways.

9. CONCLUSION. Result roots entail change while PC roots do not, contra bifurcation — 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 a given word'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.

Accepting these conclusions, however, does not blunt the predictive power of event structural approaches. Rather, it simply addresses the larger challenge posed by Dowty (1979: 125-129) by suggesting a more complex theory of possible verb meanings is needed within theories of event structure. For example, if a word entails change this does not technically require a v_{become}-type component in its event structure, nor any of its concomitant grammatical behavior. Yet if other evidence suggests a v_{become}-type component the prediction is that the verb should have certain grammatical and semantic properties. Furthermore, patterns of sublexical modification suggest a critical role for event templates, since templates have a decompositional structure that 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 potentially predictive — and 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. (See Beavers & Koontz-Garboden 2020: 104, 155-157, 209-210, 226-233 for further discussion.)

Having said that, as shown in §3.6 and §8, despite the conceptual elegance of the nonbifurcated analysis of the PC vs. result root distinction, bifurcated analyses of English — or indeed of any single language — are still possible. However, these analyses all rest on assuming language particular idiosyncrasies, encoded as formal diacritics such as syntactic features, root-conditioned allosemy, or type-theoretic distinctions. These diacritics are available by virtue of representing event structures as syntactic objects interpreted model theoretically as we have assumed, but equivalents in other formal frameworks for modeling event structures are always in principle possible. Given that almost any strong hypothesis about (im)possible verbs — such as the ones outlined above — can likely be saved in such a way in the face of potential counterexamples found in any language, this raises the possibility that event structural approaches may not make especially strong predictions for any one given language. However, the understanding that accidents by definition do not recur and recur across languages provides a check against such language particular analyses, a point presaged by Haiman (1974: 1) and made in the modern literature on morphemes by Koontz-Garboden (2016). Thus critical here is the use of the crosslinguistic and typological methodology we have employed to argue against bifurcation, though the same logic should hold for any prediction a reasonably rich theory of event structures makes. This justifies the value of the methodology we have adopted here for more fully realizing the predictive power of formal models of event structures.

In sum, while bifurcation is a reasonable principle about (im)possible words, with its clean division of labor between templates and roots, we have shown that certain root meanings across languages exhibit templatic entailments such as change. This requires a richer possible semantic content for 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 or checked against a native speaker informants (for Spanish, German, and French data were collected from resources but checked by a native speaker). Otherwise all languages are from WALS 100 and data were collected through dictionary and grammatical resources.

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)
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, Algic)
Hopi (Hopi, Uto-Aztecan)
Yaqui (Cahita, Uto-Aztecan)
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 Guaicuran, Guaicuran)
Paumarí (Arauan)
Huallaga Quechua (Quechuan)
Warao (Warao)
Yagua (Peba-Yaguan)

PAPUNESIA Alamblak (Sepik Hill, Sepik)
Kwoma (Middle Sepik, Sepik)
Anejom̃ (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
aged/old/age	0	81	0.00%	bent/bend	6	73	8.22%
bad/worse/worsen	80	84	95.24%	bloomed/bloom, flowered/flower, blossomed/blossom	4	65	6.15%
black/blacken	83	84	98.81%	boiled/boil	2	77	2.60%
blue/make blue	66	67	98.51%	broken/break	1	85	1.18%
brown/make brown	54	55	98.18%	burned/burn	3	82	3.66%
clean/clean	54	67	80.60%	come/came	0	81	0.00%
clear/clear	50	57	87.72%	cooked/cook, baked/bake, fried/fry, roasted/roast, steamed/steam	0	86	0.00%
cold/make cold	83	83	100.00%	cracked/crack	1	63	1.59%
cool/cool	54	63	85.71%	crushed/crush	0	71	0.00%
deep/deepen	71	72	98.61%	dead/killed/kill	5	87	5.75%
dirty/dirty	74	78	94.87%	decayed/decay, rotten/rot	2	79	2.53%
dry/dry	72	85	84.71%	destroyed/destroy, ruined/ruin	0	70	0.00%
fast/speed up	63	71	88.73%	different/differ	40	52	76.92%
good/improved/improve	83	85	97.65%	drowned/drown	1	71	1.41%
green/make green	71	72	98.61%	fermented/ferment	3	50	6.00%
hard/harden, tough/toughen	74	79	93.67%	folded/fold	0	64	0.00%
hot/heat up	80	83	96.39%	frozen/freeze	5	42	11.90%
large/big/enlarge	86	87	98.85%	go down (fallen/fall, dropped/drop, descended/descend, decreased/decrease, declined/decline)	1	85	1.18%
long/lengthen	80	82	97.56%	go in (entered/enter)	0	76	0.00%
red/redden	77	80	96.25%	go out (exited/exit)	0	63	0.00%
sharp/sharpen	67	75	89.33%	go up (raised/rise, ascended/ascend, increased/increase, gained/gain)	2	83	2.41%
short/shorten	76	77	98.70%	gone/go	0	78	0.00%
slow/slow down	63	66	95.45%	grown/grow	3	70	4.29%
small/shrunken/shrink	81	84	96.43%	melted/melt	3	64	4.69%
smooth/smooth	69	73	94.52%	murdered/murder	0	45	0.00%
soft/soften	69	71	97.18%	returned/return	0	72	0.00%
straight/straighten	71	76	93.42%	rusted/rust	10	53	18.87%
strong/strengthen	76	80	95.00%	shattered/shatter	1	53	1.89%
sweet/sweeten	71	72	98.61%	snapped/snap	0	39	0.00%
tall/heigh/heighten	70	73	95.89%	split/split	0	67	0.00%
tight/tighten	55	69	79.71%	sprouted/sprout, germinated/germinate	1	63	1.59%
warm/warm	63	68	92.65%	swollen/swell	1	79	1.27%
weak/weaken	61	68	89.71%	tarnished/tarnish	3	32	9.38%
wet/wet	71	83	85.54%	torn/tear, ripped/rip	0	77	0.00%
white/whiten	81	84	96.43%	withered/wither, wilted/wilt	1	59	1.69%
wide/widen	76	78	97.44%	wrinkled/wrinkle, creased/crease	2	61	3.28%

TABLE 2. 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
aged/old/age	10	36	27.78%
bad/worse/worsen	21	39	53.85%
black/blacken	27	35	77.14%
blue/make blue	10	15	66.67%
brown/make brown	10	12	83.33%
clean/clean	14	38	36.84%
clear/clear	13	37	35.14%
cold/make cold	27	45	60.00%
cool/cool	30	44	68.18%
deep/deepen	17	21	80.95%
dirty/dirty	21	42	50.00%
dry/dry	32	64	50.00%
fast/speed up	15	33	45.45%
good/improved/improve	30	46	65.22%
green/make green	14	16	87.50%
hard/harden, tough/toughen	26	43	60.47%
hot/heat up	28	54	51.85%
large/big/enlarge	25	47	53.19%
long/lengthen	26	37	70.27%
red/redden	31	35	88.57%
sharp/sharpen	14	46	30.43%
short/shorten	21	35	60.00%
slow/slow down	12	23	52.17%
small/shrunken/shrink	17	51	33.33%
smooth/smooth	14	32	43.75%
soft/soften	21	37	56.76%
straight/straighten	17	38	44.74%
strong/strengthen	21	38	55.26%
sweet/sweeten	12	21	57.14%
tall/heigh/heighten	15	31	48.39%
tight/tighten	17	39	43.59%
warm/warm	26	45	57.78%
weak/weaken	24	37	64.86%
wet/wet	19	52	36.54%
white/whiten	27	35	77.14%
wide/widen	22	35	62.86%

RESULT ROOT	#MARKED	#LANGUAGES	MARKED
bent/bend	14	57	24.56%
bloomed/bloom, flowered/flower, blossomed/blossom	5	54	9.26%
boiled/boil	13	72	18.06%
broken/break	21	80	26.25%
burned/burn	11	79	13.92%
come/came	4	80	5.00%
cooked/cook, baked/bake, fried/fry, roasted/roast, steamed/steam	12	79	15.19%
cracked/crack	11	55	20.00%
crushed/crush	6	64	9.38%
dead/killed/kill	9	86	10.47%
decayed/decay, rotten/rot	11	58	18.97%
destroyed/destroy, ruined/ruin	9	64	14.06%
different/differ	8	27	29.63%
drowned/drown	12	68	17.65%
fermented/ferment	4	43	9.30%
folded/fold	6	53	11.32%
frozen/freeze	5	38	13.16%
go down (fallen/fall, dropped/drop, descended/descend, decreased/decrease, declined/decline)	16	83	19.28%
go in (entered/enter)	6	71	8.45%
go out (exited/exit)	7	60	11.67%
go up (raised/rise, ascended/ascend, increased/increase, gained/gain)	16	82	19.51%
gone/go	4	73	5.48%
grown/grow	9	67	13.43%
melted/melt	16	61	26.23%
murdered/murder	5	42	11.90%
returned/return	11	70	15.71%
rusted/rust	9	37	24.32%
shattered/shatter	7	48	14.58%
snapped/snap	4	37	10.81%
split/split	11	60	18.33%
sprouted/sprout, germinated/germinate	5	59	8.47%
swollen/swell	13	65	20.00%
tarnished/tarnish	9	30	30.00%
torn/tear, ripped/rip	16	70	22.86%
withered/wither, wilted/wilt	7	46	15.22%
wrinkled/wrinkle, creased/crease	15	43	34.88%

TABLE 3. 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	51.96	128	48.05	50.78	Koasati	70	0.00	68	1.47	17.65
Alamblak	20	10.00	10	0.00	10.00	Koiari	57	15.79	48	22.92	31.25
Anejom̃	85	0.00	54	0.00	88.89	Korean	94	11.70	88	27.27	34.09
Arabic (Egyptian)	76	93.42	272	45.77	27.76	Koyraboro Senni	55	0.00	54	11.11	9.26
Barasano	73	0.00	45	4.44	66.67	Kwoma	63	0.00	36	0.00	69.44
Bariai	85	1.18	37	2.70	37.84	Lakhota	68	2.94	70	12.14	23.57
Basque	82	9.76	147	10.88	45.58	Lezgian	81	3.70	29	6.90	44.83
Berber (Middle Atlas)	94	67.02	187	8.56	32.09	Malagasy	73	53.42	119	66.39	5.88
Burmese	88	1.14	90	1.11	67.22	Mandarin	101	3.96	190	13.16	38.68
Burushaski	106	10.38	92	4.35	38.04	Mapudungun	75	2.67	85	4.71	30.59
Carib	48	52.08	47	55.32	14.89	Martuthunira	50	0.00	36	19.44	11.11
Chamorro	77	0.00	39	2.56	46.15	Meithei	86	4.65	61	14.75	19.67
Chukchi	51	0.00	22	4.55	25.00	Mixtec (Chalcatongo)	93	5.38	53	16.98	11.32
Cree (Plains)	105	19.05	171	71.35	22.51	Mocoví	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 (Lower Grand Valley)	31	29.03	29	44.83	6.90	Navajo	59	100.00	100	44.00	34.00
English	103	0.00	432	3.01	37.50	Oksapmin	62	0.00	15	0.00	80.00
Fijian	66	3.03	63	15.87	4.76	Oneida	55	98.18	57	58.77	34.21
Finnish	104	15.38	469	21.64	23.99	Oromo (Harar)	57	28.07	88	94.89	4.55
French	87	0.00	377	11.27	18.17	Otomí	172	2.33	97	11.34	67.01
Georgian	78	5.13	38	52.63	10.53	Paiwan	60	61.67	71	52.11	9.86
German	68	11.76	287	14.29	17.60	Paumarí	61	90.16	52	75.00	15.38
Gooniyandi	33	0.00	3	0.00	100.00	Persian	91	14.29	100	15.00	30.00
Greek (Modern)	76	2.63	154	8.44	42.86	Pintupi	75	21.33	73	31.51	6.85
Guaraní	95	1.05	95	4.21	46.32	Quechua (Huallaga)	93	9.68	62	9.68	14.52
Gújjolaay Eegimaa	75	97.33	263	5.70	47.91	Rama	54	0.00	40	15.00	5.00
Hausa	73	20.55	90	50.56	26.67	Russian	82	4.88	273	15.02	20.51
Hawaiian	116	0.86	88	3.41	39.77	Sango	102	3.92	171	4.09	87.13
Hebrew (Modern)	89	100.00	315	53.02	25.87	Spanish	74	2.70	287	17.60	8.01
Hindi	93	2.15	172	22.97	19.77	Swahili	98	20.41	177	22.60	22.32
Hopi	75	21.33	142	35.21	5.63	Tagalog	93	38.71	78	69.23	19.23
Huitoto (Minica)	85	43.53	46	27.17	63.04	Tenango Tzeltal	76	5.26	303	19.80	10.23
Indonesian	94	15.96	159	3.77	37.42	Thai	102	3.92	94	3.19	60.64
Jakaltek	57	0.00	16	0.00	43.75	Tiwi	45	0.00	17	5.88	52.94
Japanese	83	2.41	100	38.00	20.00	Tsimshian (Coast)	73	6.85	38	2.63	65.79
Kakataibo	123	26.02	531	14.69	16.57	Turkish	89	8.99	199	14.32	5.28
Kannada	71	14.08	30	13.33	50.00	Vietnamese	71	0.00	144	18.06	22.92
Karok	75	13.33	29	24.14	27.59	Warao	60	1.67	104	15.87	22.60
Kayardild	49	0.00	45	26.67	0.00	Yagua	124	4.84	151	9.93	47.68
Kewa	71	0.00	13	0.00	76.92	Yaqui	76	1.32	85	26.47	22.94
Khalkha	65	13.85	167	27.25	8.68	Yoruba	175	2.29	204	2.94	62.75
Khoekhoe	89	0.00	124	7.26	28.23	Yup'ik	66	12.12	88	13.64	20.45
Kinyarwanda	69	5.80	113	3.54	44.25	Zoque (Copainalá)	69	0.00	149	14.09	14.43
Kiowa	23	0.00	9	11.11	0.00	Zulu	84	0.00	212	16.75	39.15

TABLE 4. 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 nonderivationally, i.e. as labile or unrelated)

REFERENCES

ALEXIADOU, ARTEMIS, and ELENA ANAGNOSTOPOULOU. 2004. Voice morphology in the causative-inchoative alternation: Evidence for a non-unified structural analysis of unaccusatives. In Alexiadou et al., 114–136.

ALEXIADOU, ARTEMIS; ELENA ANAGNOSTOPOULOU; and MARTIN EVERAERT (eds.) 2004. *The unaccusativity puzzle*. Oxford: Oxford University Press.

ALEXIADOU, ARTEMIS; ELENA ANAGNOSTOPOULOU; and FLORIAN SCHÄFER. 2006. The properties of anti-causatives crosslinguistically. *Phases of interpretation*, ed. by Mara Frascarelli, 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. *Elements of grammar*, ed. by Liliane Haegeman, 73–137. Dordrecht: Kluwer.

BEAVERS, JOHN. 2012. Lexical aspect and multiple incremental themes. *Telicity, change, and state: A cross-categorial view of event structure*, ed. by Violeta Demonte and Louise McNalley, 23–59. Oxford: Oxford University Press.

BEAVERS, JOHN, and ANDREW KOONTZ-GARBODEN. 2012. Manner and result in the roots of verbal meaning. *Linguistic Inquiry* 43.331–369.

BEAVERS, JOHN, and ANDREW KOONTZ-GARBODEN. 2020. The Roots of Verbal Meaning. Oxford: Oxford University Press. Online: http://fdslive.oup.com/www.oup.com/academic/pdf/openaccess/9780198855781.pdf

BECK, SIGRID, and 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.

BROWN, CECIL H. 2013a. Finger and hand. In Dryer & Haspelmath. Online: https://wals.info/chapter/130.

BROWN, CECIL H. 2013b. Hand and arm. In Dryer & Haspelmath. Online: https://wals.info/chapter/129.

CHIERCHIA, GENNARO. 2004. A semantics for unaccusatives and its syntactic consequences. In Alexiadou et al., 22–59.

DAVIS, ANTHONY. 2001. *Linking by types in the hierarchical lexicon*. Stanford: CSLI Publications.

DAVIS, ANTHONY, and JEAN-PIERRE KOENIG. 2000. Linking as constraints on word classes in a hierarchical lexicon. *Language* 76.56–91.

DEO, ASHWINI; ITAMAR FRANCEZ; and 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; and ANDREW KOONTZ-GARBODEN. 2013. From change to value difference in degree achievements. *Proceedings of semantics and linguistic theory 23*, 97–115. Ithaca, NY: CLC Publications.

DHONGDE, RAMESH VAMAN, and 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., and MARTIN HASPELMATH (eds.) 2013. *The world atlas of language structures online*. Leipzig: Max Planck Institute for Evolutionary Anthropology.

DUNBAR, EWAN, and ALEXIS WELLWOOD. 2016. Addressing the "two interface" problem: Comparatives and superlatives. *Glossa* 1.1–29.

EMBICK, DAVID. 2004a. On the structure of resultative participles in English. *Linguistic Inquiry* 35.355–392.

EMBICK, DAVID. 2004b. On the structure of resultative participles in English. *Linguistic Inquiry* 35.355–392.

EMBICK, DAVID. 2009. Roots, states, and stative passives. Talk given that the 2009 Roots Workshop, Stuttgart.

FILLMORE, CHARLES. 1970. The grammar of hitting and breaking. *Readings in English transformational grammar*, ed. by Roderick Jacobs and Peter Rosenbaum. Waltham, MA: Ginn.

FODOR, JERRY. 1970. Three reasons for not deriving 'kill' from 'cause to die'. *Linguistic Inquiry* 1.429–438.

FOLLI, RAFFAELLA, and HEIDI HARLEY. 2004. Consuming results: Flavors of little-*v*. *Aspectual enquiries*, ed. by Paula Kempchimsky and Roumyana Slabakova, 1–25. Dordrecht: Kluwer.

FOLLI, RAFFAELLA, and GILLIAN RAMCHAND. 2002. Event structure composition: The case of goal of motion and resultative constructions in Italian and Scottish Gaelic. *Proceedings of perspectives on aspect conference*, ed. by Henk J. Verkuyl. Utrecht: OTS.

FRANCEZ, ITAMAR, and 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.

HAIMAN, JOHN. 1974. Concessives, conditionals, and verbs of volition. *Foundations of Language* 11.341–359.

HALE, KEN, and SAMUEL JAY KEYSER. 1997. The limits of argument structure. *Theoretical issues at the morphology-syntax interface*, ed. by Amaya Mendikoetxea and Myriam Uribe-Etxebarria, 203–230. Bilbao: Universidad de País Vasco, Euskal Herriko Univertsitatea.

HALE, KENNETH L., and SAMUEL JAY KEYSER. 1993. On argument structure and the lexical expression of syntactic relations. *The view from building 20: Essays in linguistics in honor of Sylvain Bromberger*, ed. by Ken Hale and Samuel Jay Keyser. Cambridge, MA: MIT Press.

HALE, KENNETH L., and SAMUEL JAY KEYSER. 1998. The basic elements of argument structure. *Papers from the UPenn/MIT roundtable on argument structure and aspect*, vol. 32, 73–118. MITWPL.

HALE, KENNETH L., and SAMUEL JAY KEYSER. 2002. *Prolegomenon to a theory of argument structure*. Cambridge, MA: MIT Press.

HARLEY, HEIDI. 2003. Possession and the double object construction. *Linguistic variation yearbook 2*, ed. by Pierre Pica and Johan Rooryck, 31–70. Amsterdam: John Benjamins.

HARLEY, HEIDI. 2005. How do verbs get their names? denominal verbs, manner incorporation, and the ontology of verb roots in english. *The syntax of aspect*, ed. by Nomi Erteschik-Shir and Tova Rapoport, 42–64. Oxford: Oxford University Press.

HARLEY, HEIDI. 2012. Lexical decomposition in modern syntactic theory. *The Oxford handbook of compositionality*, ed. by Wolfram Hinzen, Edouard Machery, and Markus Werning, 328–350. Oxford: Oxford University Press.

HARLEY, HEIDI. 2014. On the identity of roots. *Theoretical Linguistics* 40.225–276.

HASPELMATH, MARTIN. 1993. More on the typology of inchoative/causative verb alternations. *Causatives and transitivity*, ed. by Bernard Comrie and Maria Polinsky, 87–120. Amsterdam: John Benjamins.

HASPELMATH, MARTIN; ANDREEA CALUDE; MICHAEL SPAGNOL; HEIKO NARROG; and ELIF BAMYACI. 2014. Coding causal-noncausal verb alternations: A form-frequency correspondence explanation. *Journal of Linguistics*, 587–625.

HAY, JENNIFER; CHRISTOPHER KENNEDY; and BETH LEVIN. 1999. Scalar structure underlies telicity in degree achievements. *The proceedings of SALT IX*, 127–144.

HOPI DICTIONARY PROJECT. 1998. *Hopi dictionary/hopìikwa lavàytutuveni: A hopi–english dictionary of the third mesa dialect*. Tucson: University of Arizona Press.

JACKENDOFF, RAY. 1990. *Semantic structures*. Cambridge, MA: MIT Press.

JERRO, KYLE. 2017a. The causative-instrumental syncretism. *Journal of Linguistics* 53.751–788.

JERRO, KYLE. 2017b. Change-of-state in Kinyarwanda: a study in root meaning. *Proceedings of the Linguistic Society of America Annual Meeting 2017*.

JERRO, KYLE. 2018. Change-of-state paradigms and the middle in Kinyarwanda. *Southern African Linguistics and Applied Language Studies* 36.235–260.

JESPERSEN, OTTO. 1933. *Essentials of English grammar*. London: George Allen & Unwin Ltd.

KENNEDY, CHRISTOPHER, and BETH LEVIN. 2008. Measure of change: The adjectival core of degree achievements. *Adjectives and adverbs: Syntax, semantics, and discourse*, ed. by Louise McNally and Chris Kennedy, 156–182. Oxford, UK: Oxford University Press.

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 Proceedings of the 32nd annual meeting of the Berkeley Linguistics Society.

KOONTZ-GARBODEN, ANDREW. 2007a. Aspectual coercion and the typology of change of state predicates. *Journal of Linguistics* 43.115–152.

KOONTZ-GARBODEN, ANDREW. 2007b. *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. 2016. Thoughts on diagnosing morphomicity: A case study from Ulwa. *The morpheme debate*, ed. by Ana R. Luís and Ricardo Bermúdez-Otero, 89–111. Oxford: Oxford University Press.

KRATZER, ANGELIKA. 2000. Building statives. *Bls 26*, 385–399.

LAKOFF, GEORGE. 1966. *On the nature of syntactic irregularity*. Bloomington, IN: Indiana University dissertation. Published 1970 as *Irregularity in syntax*. New York: Holt, Rinehart, and Winston.

LANGACKER, RONALD. 1986. Abstract motion. *Proceedings of the 12th annual meeting of the berkeley linguistics society*, 455–471. Berkeley, CA: Berkeley Linguistics Society.

LEVIN, BETH. 1993. *English verb classes and alternations*. Chicago, IL: University of Chicago Press.

LEVIN, BETH, and MALKA RAPPAPORT HOVAV. 1995. *Unaccusativity: At the syntax-lexical semantics interface*. Cambridge, MA: MIT Press.

LEVINSON, LISA. 2007. *The roots of verbs*. New York: NYU dissertation.

LUNDQUIST, BJÖRN; MARTIN CORLEY; MAI TUNGSETH; ANTONELLA SORACE; and GILLIAN C RAMCHAND. 2016. Anticausatives are semantically reflexive in norwegian but not in english. *Glossa* 1.

MARANTZ, ALEC. 1997. No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. *Proceedings of the 21st annual penn linguistics colloquium*, *University of Pennsylvania Working Papers in Linguistics*, vol. 4.2, 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.

MATSUMOTO, YO. 1996. Subjective motion and English and Japanese verbs. *Cognitive Linguistics* 7.183–226.

MCCAWLEY, JAMES D. 1971. Prelexical syntax. *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. 1969. Nekotorye verojatnostnye universalii v glagol'nom slovoobrazovanii. *Jazykovye universalii i lingvisticheskaja tipologija*, ed. by I.F. Vardul, 106–114. Moscow: Nauka.

NEDJALKOV, VLADIMIR P., and SERGEJ JE. JAXONTOV. 1988. The typology of resultative constructions. *Typology of resultative constructions*, ed. by Vladimir P. Nedjalkov, 3–62. Amsterdam: John Benjamins.

NEDJALKOV, VLADIMIR P., and G.G. SILNITSKY. 1973. The typology of morphological and lexical causatives. *Trends in Soviet theoretical linguistics*, ed. by Ferenc Kiefer, 1–32. Dordrecht: D. Reidel Publishing.

NGUYỄN, VĂN KHÔN. 1967. *English-vietnamese dictionary : Anh-việt tù-diên*. Saigon: Nhà Sach Kha-trí.

NICHOLS, JOHANNA. 2018. Non-linguistic conditions for causativization as a linguistic attractor. *Frontiers in Psychology* 8.1–14.

NICHOLS, JOHANNA; DAVID A. PETERSON; and JONATHAN BARNES. 2004. Transitivizing 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, and BETH LEVIN. 1998. Building verb meanings. *The projection of arguments: Lexical and compositional factors*, ed. by Miriam Butt and Willhel Geuder, 97–133. Stanford: CSLI Publications.

ROSS, JOHN ROBERT. 1972. Act. *Semantics of natural language*, ed. by Donald Davidson and Gilbert Harman, 70–126. Dordrecht: Reidel.

SCHÄFER, FLORIAN. 2009. The causative alternation. *Language and linguistics compass* 3.641–681.

SCHÄFER, FLORIAN, and MARGOT VIVANCO. 2016. Anticausatives are weak scalar expressions, not reflexive expressions. *Glossa: a journal of general linguistics* 1.

SEISS, MELANIE. 2013. *Murrinh-patha complex verbs: Syntactic theory and computational implementation*. Universitat Konstanz dissertation.

SHIBATANI, MASAYOSHI. 1976. The grammar of causative constructions: A conspectus. *The grammar of causative constructions*, ed. by Masayoshi Shibatani, 1–39. New York: Academic Press.

SHIBATANI, MASAYOSHI, and PRASHANT PARDESHI. 2001. The causative continuum. *The grammar of causation and interpersonal manipulation*, ed. by Masayoshi Shibatani, 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. *The lexicon in the organization of language*, ed. by Urs Egli, Peter E. Pause, Christoph Shwarze, Arnim von Stechow, and Götz Weinold, 81–118. Amsterdam and Philedelphia: 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. *Modifying adjuncts*, ed. by Ewald Lang, Claudia Fabricius-Hansen, and Catherine Maienborn, 517–454. Berlin: Mouton.

SWEETSER, EVE. 1997. Role and individual interpretations of change predicates. *Language and conceptualization*, ed. by Jan Nuyts and Eric Pederson, 116–136. Cambridge: Cambridge University Press.

TALMY, LEONARD. 2000. *Towards a cognitive semantics*. Cambridge, MA: MIT Press.

THOMPSON, SANDRA. 1988. A discourse approach to the cross-linguistic category 'adjective'. *Explaining language universals*, ed. by John A. Hawkins, 167–185. Oxford: Basil Blackwell.

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; and ANDREW KOONTZ-GARBODDEN. 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., and RANDY J. LAPOLLA. 1997. *Syntax: Structure, meaning, and function*. Cambridge: Cambridge University Press.

WOOD, JIM, and 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.

[jtbeavers@utexas.edu] (Beavers)
[everdellm@utexas.edu] (Everdell)
[k.jerro@essex.ac.uk] (Jerro)
[henri.kauhanen@uni-konstanz.de] (Kauhanen)
[andrewkg@manchester.ac.uk] (Koontz-Garboden)
[eliseal@uw.edu] (Lebovidge)
[stephen.nichols@manchester.ac.uk] (Nichols)

STATES AND CHANGES-OF-STATE: A CROSS-LINGUISTIC STUDY OF THE ROOTS OF VERBAL MEANING

SUPPLEMENTAL MATERIALS ON ALTERNATIVE STATISTICAL TREATMENTS

JOHN BEAVERS
The University of Texas at Austin

MICHAEL EVERDELL
The University of Texas at Austin

KYLE JERRO
University of Essex

HENRI KAUHANEN
University of Konstanz

ANDREW KOONTZ-GARBODEN
The University of Manchester

ELISE LEBOVIDGE
University of Washington

STEPHEN NICHOLS
The University of Manchester

1. NO EFFECT ON RESULTS WHEN INCLUDING 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. Here we present the same tests used in the paper, but with hypothetical data included. Including 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. S1 (PC median = 96.82%, result median = 1.79%, $U = 1265.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed). The root subclasses generally patterned in much the same way when hypotheticals were included, as in Fig. S2. 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. S3, and this did not change the significance of the distinction (PC median = 98.61%, result median = 39.84%, $U = 1295$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

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. S4 (PC median = 68.93%, result median = 20.84%, $U = 1294$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed). The significance of the results also did not change when we assumed missing verbs were marked (Fig. S5; PC median = 79.44%, result median = 25.89%, $U = 1293$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed), or when we assumed missing verbs were unmarked (Fig. S6; PC median = 45.10%, result median = 19.76%, $U = 1291$,

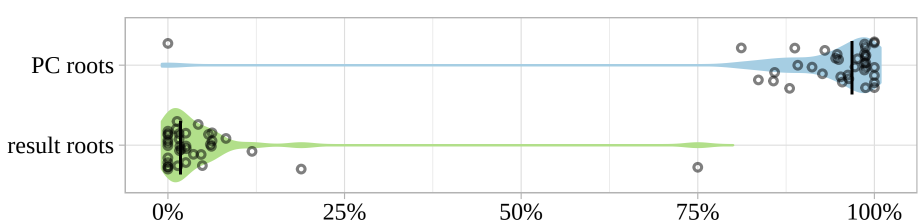


FIGURE S1. Percentage of Languages With Underived States by Root Class Coded by Translation with Hypotheticals Included

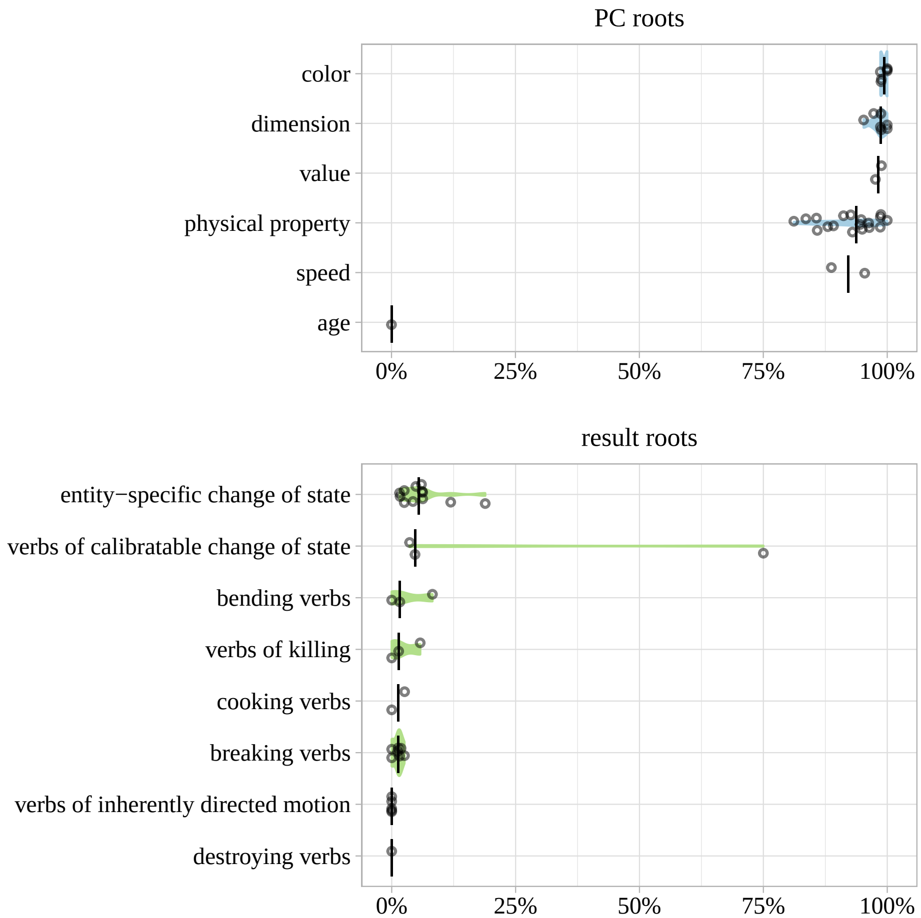


FIGURE S2. Percentage of Languages With Underived States by Root Subclass Coded by Translation with Hypotheticals Included

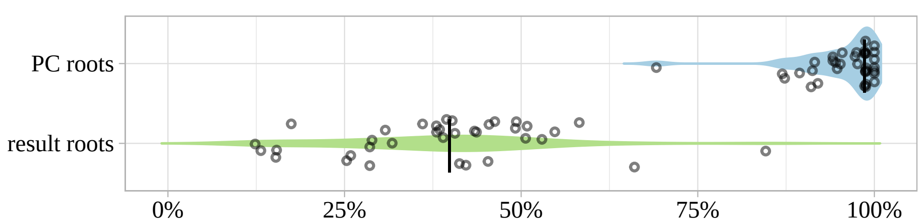


FIGURE S3. Percentage of Languages With Underived States by Root Class Coded by Morphology with Hypotheticals Included

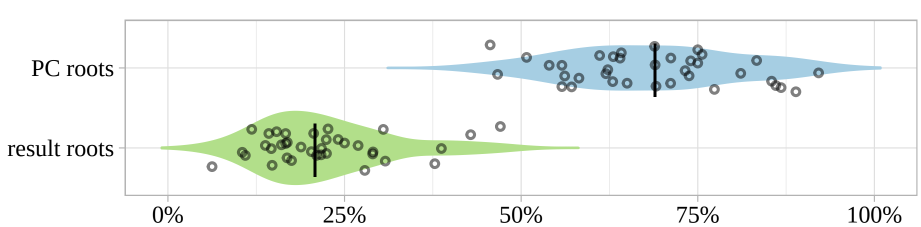


FIGURE S4. Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms with Hypotheticals Included

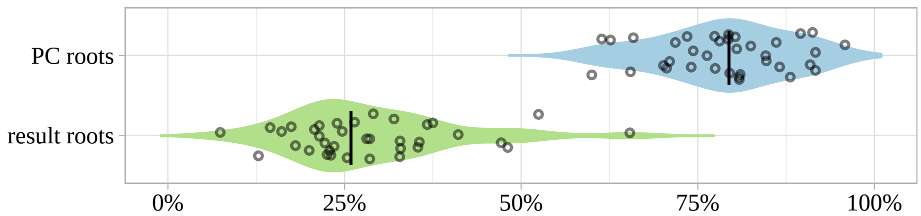


FIGURE S5. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked with Hypotheticals Included

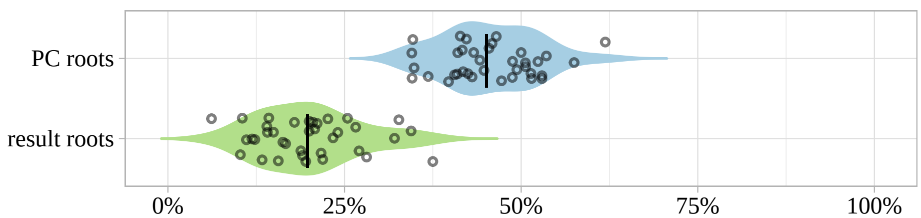


FIGURE S6. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked with Hypotheticals Included

$n_1 = n_2 = 36$, $p < 0.001$ one-tailed). When missing PC root verbs were assumed unmarked and missing result root verbs marked, the difference became statistically significant under the inclusion of hypothetical forms (Fig. S7; PC median = 46.77%, result median = 26.06%, $U = 1159$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed), in contrast to no statistically significant difference when hypothetical forms are excluded, as reported in the main paper. In sum, the presence of hypotheticals in the data had no impact on the results, except in the hypothetical scenario in which missing PC root verbs were assumed to be unmarked and missing result root verbs marked, in which case the difference in markedness between PC and result root verbs in fact becomes statistically significant in the direction expected under our analysis.

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 S8–S13 show the distributions over all Monte Carlo runs for each of our data conditions excluding hypotheticals, while Figures S14–S19 show the distributions for all of our data conditions with hypotheticals. The distributions are broadly similar to the single-run distributions reported in the main paper (hypothetical forms excluded) and in §1 above

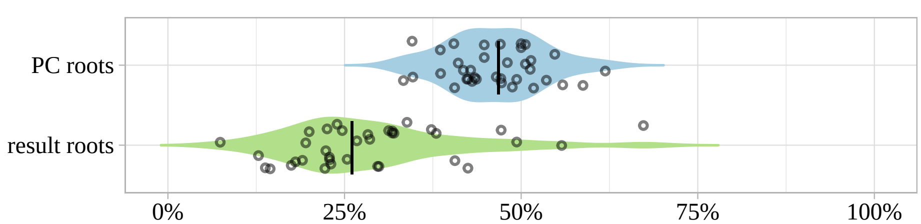


FIGURE S7. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked with Hypotheticals Included (hypothetical forms included). Figures S20–S25 and Figures S26–S31 show a different view of the Monte Carlo data, by plotting the distribution of PC root and result root medians across 1,000 Monte Carlo runs excluding hypotheticals and 1,000 Monte Carlo runs including hypotheticals respectively. Variation in these medians is minimal and, crucially, all PC root medians are higher than the corresponding result root medians, except in the hypothetical scenario where missing PC roots are assumed unmarked and missing result roots marked.

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 excluding and including hypotheticals separately. Tables S1 and S2 supply the smallest and greatest p-value observed across all runs for each data condition.

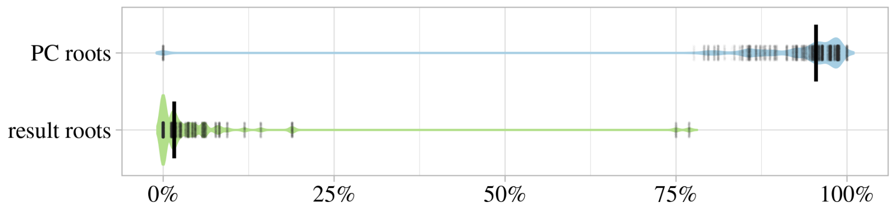


FIGURE S8. Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Excluded

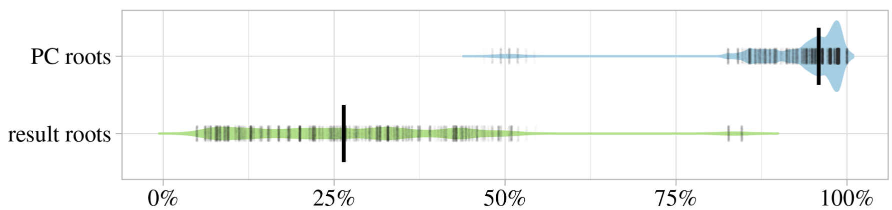


FIGURE S9. Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Excluded

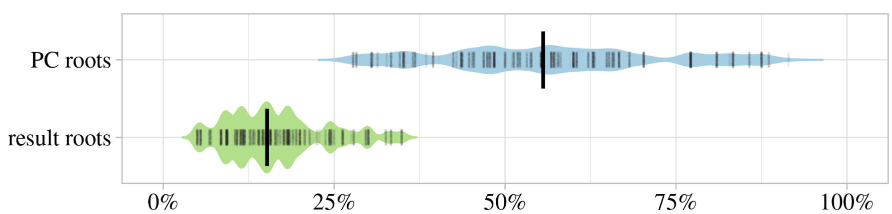


FIGURE S10. Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Excluded

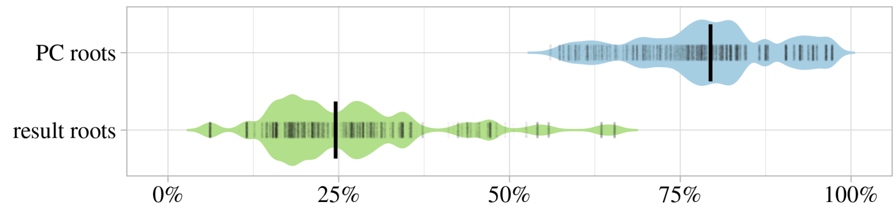


FIGURE S11. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

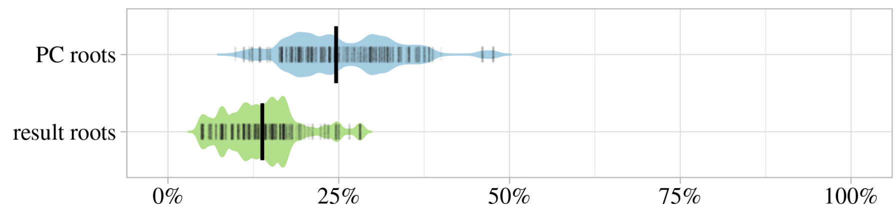


FIGURE S12. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Excluded

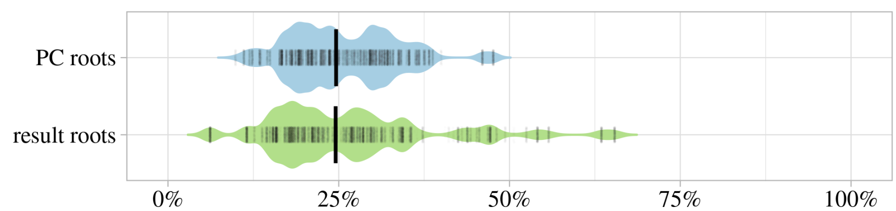


FIGURE S13. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

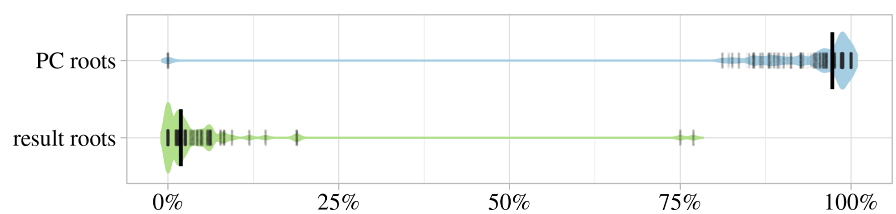


FIGURE S14. Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Included

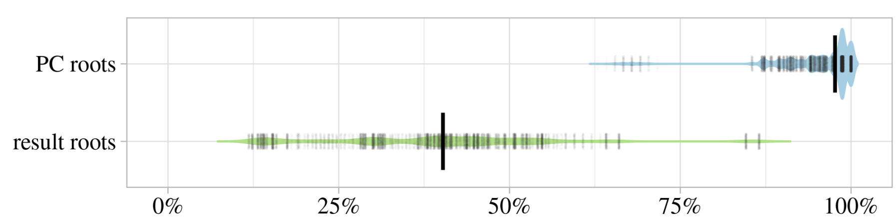


FIGURE S15. Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Included

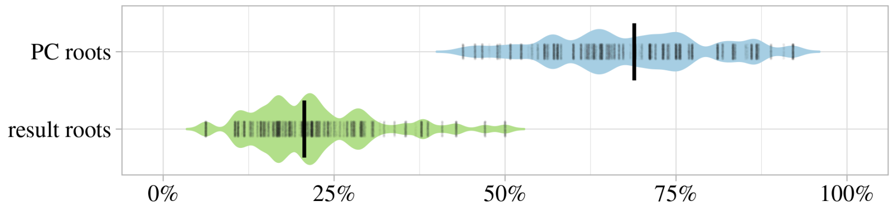


FIGURE S16. Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Included

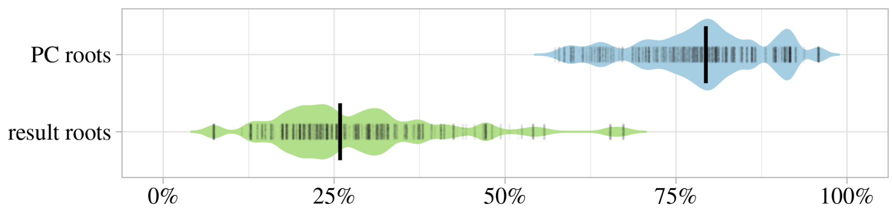


FIGURE S17. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Included

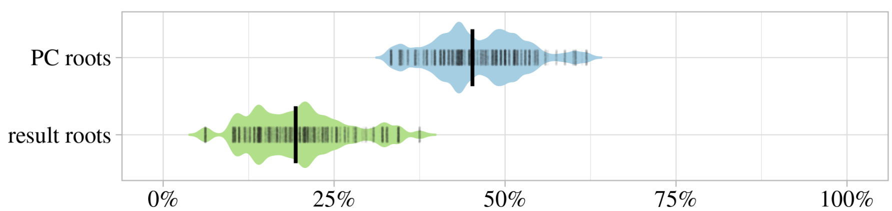


FIGURE S18. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Included

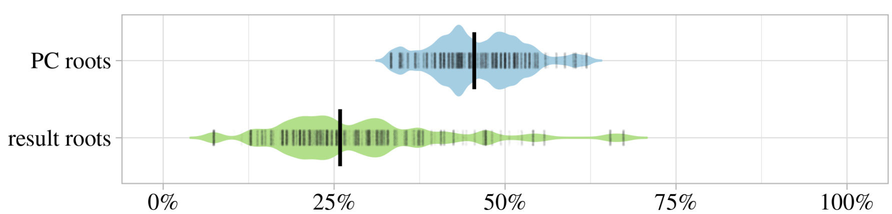


FIGURE S19. Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Included

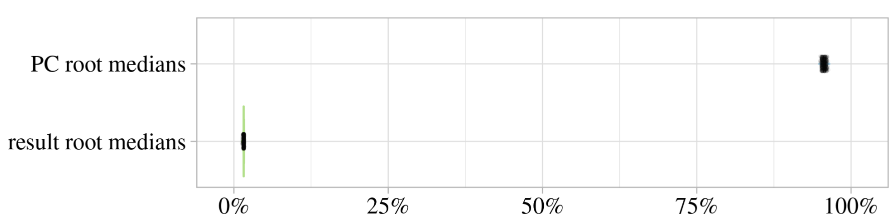


FIGURE S20. Medians of the Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Excluded

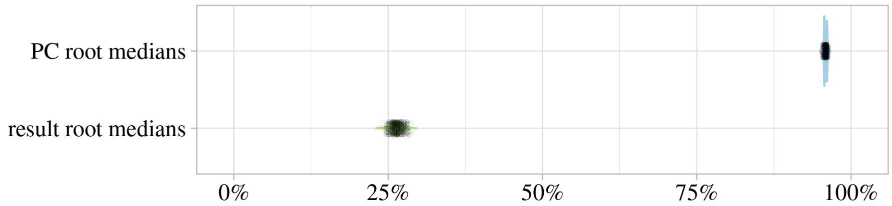


FIGURE S21. Medians of the Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Excluded

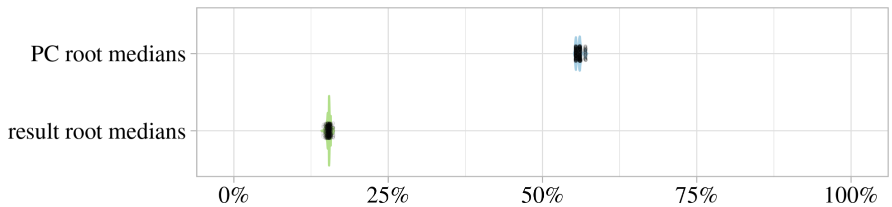


FIGURE S22. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Excluded

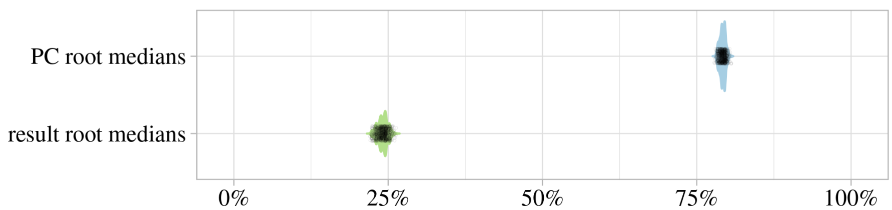


FIGURE S23. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

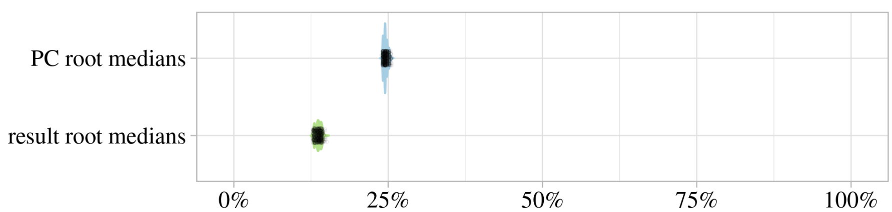


FIGURE S24. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Excluded

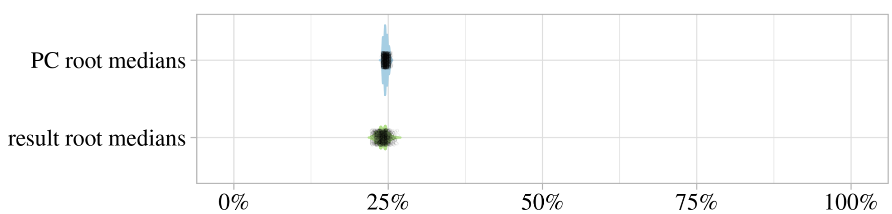


FIGURE S25. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

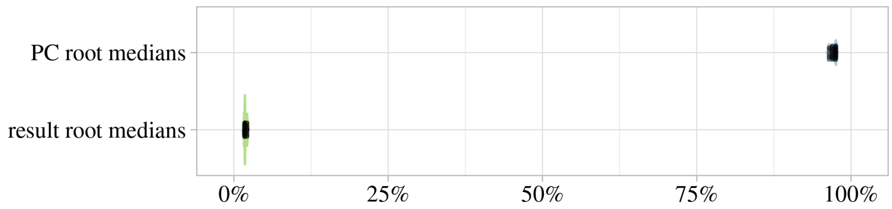


FIGURE S26. Medians of the Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Included

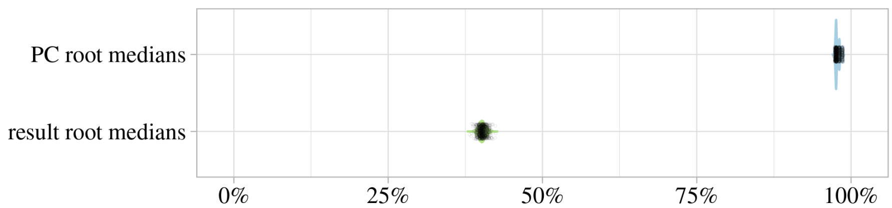


FIGURE S27. Medians of the Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Included

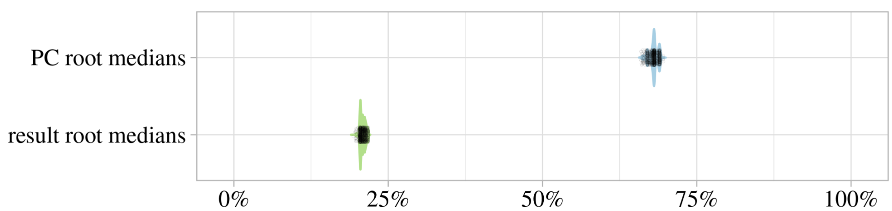


FIGURE S28. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Included

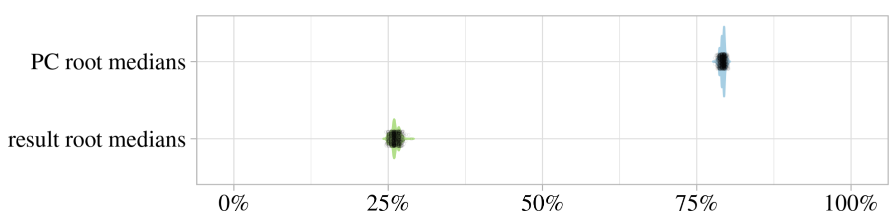


FIGURE S29. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Included

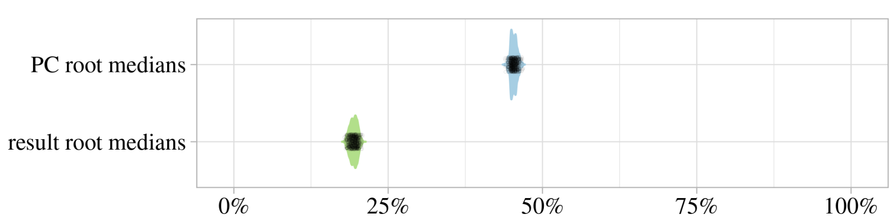


FIGURE S30. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Included

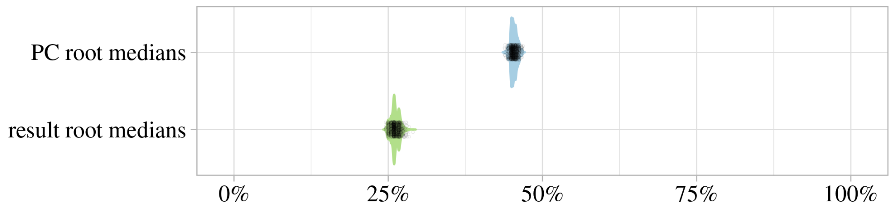


FIGURE S31. Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Included

DATA CONDITION (WITH HYPOTHETICALS EXCLUDED)	MIN. p-VALUE	MAX. p-VALUE	
Percentage of Languages With Underived States by Root Class Coded by Translation	1.30×10^{-12}	1.41×10^{-12}	***
Percentage of Languages With Underived States by Root Class Coded by Morphology	1.64×10^{-13}	2.31×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms	1.80×10^{-13}	4.47×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked	1.80×10^{-13}	2.51×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked	1.97×10^{-10}	1.20×10^{-8}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked	0.23	0.59	N.S.

TABLE S1. Smallest and 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 (*** = all runs statistically significant at $p < 0.001$; N.S. = no runs statistically significant)

DATA CONDITION (WITH HYPOTHETICALS INCLUDED)	MIN. p-VALUE	MAX. p-VALUE	
Percentage of Languages With Underived States by Root Class Coded by Translation	1.48×10^{-12}	1.75×10^{-12}	***
Percentage of Languages With Underived States by Root Class Coded by Morphology	1.57×10^{-13}	1.93×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms	1.65×10^{-13}	1.96×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked	1.95×10^{-13}	2.51×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked	1.51×10^{-13}	2.96×10^{-13}	***
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked	1.11×10^{-9}	1.88×10^{-8}	***

TABLE S2. Smallest and 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 (*** = all runs statistically significant at $p < 0.001$)

3. MIXED EFFECTS LOGISTIC REGRESSIONS. An alternative way of assessing differences in the ways PC and result roots pattern is by means of a generalized linear mixed model. Specifically, we ran a mixed effects logistic regression with root class (PC vs. result) as a fixed effect, employing a random intercept for language and root, for each of the following binary dependent variables:

1. Existence of Stative Form Coded by Translation
2. Existence of Stative Form Coded by Morphology
3. Markedness of Verbal Paradigm For Complete Paradigms
4. Markedness of Verbal Paradigm Assuming Missing Forms are Marked
5. Markedness of Verbal Paradigm Assuming Missing Forms are Unmarked
6. Markedness of Verbal Paradigm Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked

Each regression was conducted twice: once with hypothetical forms included and once without hypotheticals. Version 1.1-25 of the lme4 package (Bates et al. 2015) for R version 3.6.3 (R Core Team 2020) was employed. A random slope was considered for the language factor, but most models failed to converge on this richer random effect structure, and the final analysis was consequently conducted assuming random intercepts only.

We express the results of these regressions using PC roots as the reference level; thus, regression estimates that diverge significantly from zero indicate that result roots pattern differently from PC roots (and, for negative coefficients, the difference is in the direction predicted by our analysis). The results, summarized in

DEPENDENT VARIABLE	β	S.E.	z	$P(>\lvert z\rvert)$	
Existence of Stative Form Coded by Translation	-8.21	0.51	-15.96	$< 2.0 \times 10^{-16}$	***
Existence of Stative Form Coded by Morphology	-4.77	0.27	-17.77	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm For Complete Paradigms	-2.47	0.19	-13.03	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm Assuming Missing Forms are Marked	-3.16	0.20	-15.50	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm Assuming Missing Forms are Unmarked	-1.08	0.14	-7.57	3.8×10^{-14}	***
Markedness of Verbal Paradigm Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked	0.01	0.15	0.08	0.94	N.S.

TABLE S3. Mixed Effects Logistic Regression Coefficient Estimates for Result Roots, with PC Roots as Reference Level, for Various Dependent Variables, Excluding Hypotheticals (*** = $p < 0.001$; N.S. = not significant)

Tables S3 and S4, confirm the pattern found using the Mann–Whitney test: for each dependent variable, PC roots attest a higher probability of success than result roots, save for the last variable (markedness assuming missing PC forms are unmarked and missing result forms marked) when hypothetical forms are excluded.

DEPENDENT VARIABLE	β	S.E.	z	$P(>\|z\|)$	
Existence of Stative Form Coded by Translation	-8.55	0.54	-15.77	$< 2.0 \times 10^{-16}$	***
Existence of Stative Form Coded by Morphology	-4.78	0.28	-17.34	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm For Complete Paradigms	-2.92	0.19	-15.76	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm Assuming Missing Forms are Marked	-3.22	0.21	-15.70	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm Assuming Missing Forms are Unmarked	-1.94	0.13	-15.28	$< 2.0 \times 10^{-16}$	***
Markedness of Verbal Paradigm Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked	-1.14	0.15	-7.60	3.0×10^{-14}	***

TABLE S4. Mixed Effects Logistic Regression Coefficient Estimates for Result Roots, with PC Roots as Reference Level, for Various Dependent Variables, Including Hypotheticals (*** = $p < 0.001$)

REFERENCES

BATES, DOUGLAS; MARTIN MÄCHLER; BEN BOLKER; and STEVE WALKER. 2015. Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67.1–48.

R CORE TEAM. 2020. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. Online: https://www.R-project.org/.

[jtbeavers@utexas.edu] (Beavers)
[everdellm@utexas.edu] (Everdell)
[k.jerro@essex.ac.uk] (Jerro)
[henri.kauhanen@uni-konstanz.de] (Kauhanen)
[andrewkg@manchester.ac.uk] (Koontz-Garboden)
[eliseal@uw.edu] (Lebovidge)
[stephen.nichols@manchester.ac.uk] (Nichols)

STATES AND CHANGES-OF-STATE: A CROSS-LINGUISTIC STUDY OF THE ROOTS OF VERBAL MEANING

SUPPLEMENTAL MATERIALS ON LANGUAGE REFERENCES

JOHN BEAVERS
The University of Texas at Austin

MICHAEL EVERDELL
The University of Texas at Austin

KYLE JERRO
University of Essex

HENRI KAUHANEN
University of Konstanz

ANDREW KOONTZ-GARBODEN
The University of Manchester

ELISE LEBOVIDGE
University of Washington

STEPHEN NICHOLS
The University of Manchester

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: Langenschedit.

ALDERSON, A. D., and FAHIR İZ (eds.) 1987. *The Concise Oxford Turkish Dictionary*. Oxford: Clarendon Press.

ALI, MOHAMMED, and ANDRZEJ ZABORSKI. 1990. *Handbook of the Oromo language*, *Athiopistische Forschungen*, vol. 30. 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.

BAMGBOṢE, AYỌ. 1966. *A Grammar of Yoruba*, ed. by Joseph H. Greenberg and John Spencer, no. 5 in West African Language Monograph Series. London: Cambridge University Press.

DE BARRAL, BASILIO MARIA. 2000. *Diccionário warao-castellano, castellano-warao*. Caracas: Universidad Católica Andrés Bello: Hermanos Menores Capuchinos.

BAVIN, EDITH. 1982. Morphological and syntactic divergance in Lango and Acholi. *Nilotic studies: proceedings of the International Symposium on Languages and History of the Nilotic Peoples*, ed. by Rainer Vossen and Marianne Bechhaus-Gerst, *Kölner Beiträge zur Afrikanistik*, vol. 10. 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-fàránzì*. 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 Alamblak (Papua New Guinea)*. Australian National University dissertation.

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 paumarí 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'*. The University of Chicago dissertation.

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*. Bibliotéca 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*. University of Illinois at Urbana-Champaign dissertation.

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 Jacaltec Language*, *Indiana University Publications, Language Science Monographs*, vol. 12. Bloomington: Indiana University Press.

DEDRICK, JOHN M., and EUGENE H. CASAD. 1999. *Sonora 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*, *Yanga ti kidoro*, vol. 1. 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*. Australian National University dissertation.

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 PARLATIR; 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*, 1365–1401.

FORBES, DUNCAN. 1866. *A dictionary, Hindustani & English: accompanied by a reversed dictionary, English and Hindustani*. London: W.H. Allen & co.

FRANKLIN, KARL J., and JOICE FRANKLIN. 1978. A Kewa Dictionary, with Supplementary Grammatical and Anthropological Materials. *Pacific Linguistics* 53.

FRANKLIN, KARL JAMES. 1971. A Grammar of Kewa, New Guinea. *Pacific Linguistics* 16.

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*, *Monograph (Michigan State University, Committee on Northeast African Studies)*, vol. 12. 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 Guaraní 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, 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*, *Westafrikanische Studien*, vol. 19. Köln: Köppe.

HECHT, ELANOR FRANCKLE, and ERASMO SÁENZ CARRETE. 1998. *Diccionário Hak'xub'al-Kastiya español-jacalteko: un diccionário 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*, *Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde*, vol. 55. 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 = Hopìikwa lavàytutuveni: 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*, *Mouton Grammar Library*, vol. 26. 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*. Austin: University of Texas at Austin dissertation.

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)*. The University of Chicago dissertation.

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*. University of Hawaii dissertation.

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 Nginingawila 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* 5.37–63.

LLAMZON, TEODORO A. 1976. *Modern Tagalog: a functional-structural description*. The Hague: Mouton.

LOUGHNANE, R. 2009. *A grammar of Oksapmin*. Melbourne: The University of Melbourne dissertation.

LUVSANDORJ, AMARSANAA (ed.) 2006. *Oxford-Monsudar English-Mongolian dictionary*. London: Oxford University Press.

LYNCH, JOHN. 2000. A grammar of Anejom̃. *Pacific Linguistics* 507.

LYNCH, JOHN, and PHILIP TEPAHAE. 2001. Anejom̃ dictionary: diksonari blong Anejom̃: nitasviitai a nijitas antas Anejom̃. *Pacific Linguistics* 510.

MACAULAY, MONICA. 2005. *Verb First: On the syntax of verb-inital languages*, chap. The syntax of Chalcatongo Mixtec: Preverbal and postverbal, 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: RoutledgeCurzon.

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*. Cornell University dissertation.

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'šoj anglo-russkij slovar' v trjox tomax, 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'šoj anglo-russkij slovar' v trjox tomax, 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'šoj anglo-russkij slovar' v trjox tomax, 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*, *University of California Publications in Linguistics*, vol. 40. 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*, *Summer Institute of Linguistics Publications in Linguistics and Related Fields*, vol. 43. 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 - Alperta ohci kehtehayak 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-Việt Từ-điển*. Saigon: Nhà Sách Khai Trí.

NOSS, RICHARD B. 1964. *Thai Reference Grammar*. Washington: Foreign Service Institute, Department of State, United States Government.

ODONGA, ALEXANDER MWA. 2005. *Lwo-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*, *Australian Aboriginal Studies*, vol. 55. Canberra: Australian Institute of Aboriginal Studies.

OULHAJ, LAHCEN, and MUHAMMAD SHAFIQ. 2000. *Grammaire du tamazight: eléments pour une standardisation*. Rabat: Center Tarik ibn Zyad pour les études et la recherche.

OWENS, JONATHAN. 1985. *A Grammar of Harar Oromo (Northeastern Ethiopia)*, *Kuschitische Sprachstudien, Cushitic Language Studies*, vol. 4. 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*. Los Angeles: University of California Los Angeles dissertation.

PENCHOEN, THOMAS G. 1973. *Tamazight of the Ayt Ndhir*, *Afroasiatic Dialects*, vol. 1. 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*, *Languages of the world*, vol. 50. 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'Asiathèque.

RAMOS, TERESITA V. 1971. *Tagalog dictionary*. Honululu: University of Hawaii Press.

RAMSTEDT, G. J. 1968. *A Korean Grammar*, *Memoirs of the Finno-Ugric Society*, vol. 82. Oosterhout, The Netherlands: Anthropological Publications.

RANDRIAMASIMANANA, CHARLES. 1981. *A Study of the Causative Constructions of Malagasy*. University of Southern California dissertation.

RASOLOFO, ANDOVELONIAINA. 2006. *Malagasy Transitive Clause Types and Their Functions*. University of Oregon dissertation.

REAL ACADEMIA ESPAÑOLA. 2017. Diccionário 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*, *Dictionnaires Le Robert*, vol. Tome I, A-Bio. Paris.

ROBERT, PAUL. 1996b. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome II, Bip-Cout. Paris.

ROBERT, PAUL. 1996c. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome III, Couv-Ento. Paris.

ROBERT, PAUL. 1996d. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome IV, Entr-Gril. Paris.

ROBERT, PAUL. 1996e. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome V, Grim-Lil. Paris.

ROBERT, PAUL. 1996f. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome VI, Lim-O. Paris.

ROBERT, PAUL. 1996g. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome VII, P-Raisi. Paris.

ROBERT, PAUL. 1996h. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome VIII, Raiso-Sub. Paris.

ROBERT, PAUL. 1996i. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, *Dictionnaires Le Robert*, vol. Tome IX, Suc-Z. 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*. University of California, Los Angeles dissertation.

SAKSENA, ANURADHA. 1980. Causative Relations in Hindi. *General Linguistics* 20.23–38.

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 Implementa-*

tion. Universitat Konstanz dissertation.

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 Banarsidass 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.

SNOXALL, 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'Algyax. *International Journal of Lexicography* 17.1–32.

STEWART, JOHN ALEXANDER. 1955. *Manual of Colloquial Burmese*. London: Luzac.

STREET, JOHN C. 1963. *Khalkha Structure*, *Indiana University Publications, Uralic and Altaic Series*, vol. 24. Bloomington: Indiana University Press.

SUDMUK, CHOLTHICHA. 2005. *The syntax and semantics of serial verb constructions in Thai*. The University of Texas at Austin dissertation.

TABER, CHARLES R., and WILLIAM J. SAMARIN. 1965. *A dictionary of Sango*. Hartford, Ct.: Hartford Seminary Foundation.

TAÎFI, 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 FOLÁRINA SCHLEICHER. 2001. *Swahili Learners' Reference Grammar*. Madison, WI: NALRC Press.

THORNELL, CHRISTINA. 1997. *The Sango Language and its Lexicon*, *Travaux de l'institut de linguistique de Lund*, vol. 32. 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*. 1 edn. New York: Hippocrene Books.

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 Guaraní*. 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 ingleś)*, *Serie Lingüística Peruana*, vol. 48. Second edn. Lima: Instituto Lingüístico de Verano.

WILLSON, STEPHEN R. 1999. Basic Burushaski Vocabulary. *Studies in Languages of Northern Pakistan*, *Studies in Languages of Northern Pakistan*, vol. 6. National Institute of Pakistan Studies and Summer Institute of Linguistics.

WOLFART, H. CHRISTOPH. 1973. *Plains Cree: A Grammatical Study*, *Transactions of the American Philosophical Society, New Series*, vol. 63.5. 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*. University of Kansas dissertation.

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.

[jtbeavers@utexas.edu] (Beavers)
[everdellm@utexas.edu] (Everdell)
[k.jerro@essex.ac.uk] (Jerro)
[henri.kauhanen@uni-konstanz.de] (Kauhanen)
[andrewkg@manchester.ac.uk] (Koontz-Garboden)
[eliseal@uw.edu] (Lebovidge)
[stephen.nichols@manchester.ac.uk] (Nichols)