2
Entailments of change in the roots of change-of-state verbs

2.1 Two types of change-of-state verbs

As evidenced by Chapter 1, no class of verbs has had its lexical semantics better studied than change-of-state verbs, i.e. verbs which lexically entail some kind of (scalar) change in one of their participants. Such verbs have been at the forefront of work in nearly every theoretical approach to event structure and are widely assumed by theoreticians working in a variety of frameworks to motivate a decompositional approach to verb meaning in some form or another. As discussed in §1.3, the starting point of the literature on these verbs has been the separation of the change component of the verb's meaning from the stative component, with change-of-state verbs differing from one another purely in the kind of state the verb entails change into, where in the simplest case the root just denotes a state and the change comes from the template.

Taking this intuition to its extreme, we might expect that all cases are exactly like this, which would represent an example of the Bifurcation Thesis of Roots of (Embick 2009: 1) discussed in §1.4.1, repeated here:

(1) The Bifurcation Thesis of Roots: If a component of meaning is introduced by a semantic rule that applies to elements in combination [i.e. is introduced by a functional head—B/KG], then that component of meaning cannot be part of the meaning of a root.

In this chapter, we begin our argument against this view, making the explicit case for templatic meaning in the root by arguing that at least some change-of-state verbs have entailments of change arising from the meaning of the root itself rather than (just) from the template. In so doing, we make an argument against Bifurcation from possibly the most obvious empirical domain where it would be expected to hold if it were correct.¹

¹ This chapter represents a significantly revised and expanded version of Koontz-Garboden and Beavers (2017), which is presaged by Koontz-Garboden and Levin (2005) and Koontz-Garboden (2005, 2006, 2007); see also Beavers et al. (2018).
Our core observation is that there is a split between two types of change-of-state verbs in terms of whether the entailment of change is introduced solely by the template or an entailment of change is (also) present in the root itself. In particular, building on Dixon (1982: 50), we propose a distinction between change-of-state verbs whose roots describe Dixon's Property Concept (PC) states, which in English correspond to Levin's deadjectival change-of-state verbs such as those in (2), vs. change-of-state verbs based on Dixon's “states that are the result of some action” (Dixon 1982: 50), which in English correspond to Levin's (1993) non-deadjectival change-of-state verbs such as those in her break, cook, and kill verb classes, among others, as in (3):²

(2) Deadjectival COS verbs (Levin 1993: 245)
awaken, brighten, broaden, cheapen, coarsen, dampen, darken, deepen, 
fatten, flatten, freshen, gladden, harden, hasten, heighten, lengthen, lessen, 
lighten, loosen, moisten, neaten, quicken, ripen, roughen, sharpen, shorten, 
sicken, slacken, smarten, soften, stiffen, straighten, strengthen, sweeten, 
tauten, thicken, tighten, toughen, weaken, widen,…

(3) Non-deadjectival COS verbs
a. Levin's (1993: 241) break verbs: break, chip, crack, crash, crush, fracture, 
rip, shatter, smash, snap, splinter, split, tear
b. Levin's cooking verbs (Levin 1993: 243): bake, barbecue, blanch, boil, 
braise, broil, charbroil, charcoal-broil, coddle, cook, crisp, deepfry, fry, 
grill, hardboil, poach,…
d. inter alia

Crucially, while virtually all of the roots of the verbs in (2) can readily be found in contexts lacking any inference of change, the roots of the verbs in (3) cannot (modulo some exceptions, as we discuss further below). The fact that roots in the latter class cannot be disembodied from an entailment of change suggests that such an entailment must be part of the meaning of the root itself. Presaging this conclusion somewhat, we therefore refer to the roots of the verbs in (2) as PC roots and those in (3) as result roots.

Having made the semantic case for two distinct classes of roots in §2.2, we consider in §2.3 whether there are any morphophonological correlates of it.³

² The term “property concept” was not actually introduced by Dixon (1982) himself to demarcate the class of states “naturally described by adjectives” (Dixon 1982: 50), as he says, but rather by Thompson (1988: 168), whose term for Dixon’s class of states has since gained currency.

³ Calling the class in (2) “deadjectival” is simply following Levin’s (1993) terminology, and should not be taken as our prejudging the morphological nature of the members of the class.
We present evidence from the morphological typology of the two verb classes which shows that verbs based on roots in the different classes have distinct morphological composition across various templates they occur in, a fact which can already be seen in (2) and (3) and which repeats itself in different ways in other languages. We then turn to the analytical consequences of these observations. We first articulate in §2.4 a variety of ways of theoretically accommodating what we take to be the most intuitive consequence of the facts that we observe, namely that while PC roots lack templatic entailments, result roots overwhelmingly come endowed with an entailment of change, a fact which taken at face value falsifies Bifurcation. We consider how this idea can be implemented in strictly non-lexicalist and lexicalist event structural frameworks, plus frameworks that mix lexicalist and non-lexicalist assumptions, discussing the strengths and weaknesses of each type of theory. In each case the upshot is that Bifurcation must be rejected, independent of what kind of framework the question is approached from, the choice of which we believe is an issue that ultimately hinges on a much broader set of theoretical considerations and assumptions that are independent of the issues we explore here. The sum of our observations ultimately yields a verb class typology with both semantic and morphological predictions derived from a typology of roots that is orthogonal to templatically defined typologies, where the combination of what the root brings to bear and what the template brings to bear ultimately define the verb class typology, something we consider the consequences of more in §5.4.

Notwithstanding the observations we believe motivate the rejection of Bifurcation, in §2.5 we also explore what it would take to preserve it in the face of these facts, articulating theories that would fundamentally alter the meanings of result roots, that would give an allosemic treatment to the relevant templatic heads, and theories that would allow roots to select for the templates they can/cannot appear in, coupled with other assumptions designed to get the data right under the assumption of Bifurcation. As we discuss, these approaches all come with theoretical and empirical shortcomings. As a consequence, our position is that it is difficult to avoid the conclusion that result roots lexically entail change of state and that more broadly root and template meaning cannot be universally bifurcated. Nonetheless, we argue in §2.6 that despite the fact that result roots have change in their meanings, templates are still needed in the full analysis of the verbs they derive. A deeper question is why roots would violate Bifurcation and entail both a state and a change into that state simultaneously. We ultimately suggest this largely has to do with the existence of kinds of states that are conceived of as only arising from some change (or possibly some specific action, as we discuss in Chapter 4). However, we defer this deeper discussion to §5.2, after we have fully outlined our case for what roots can and cannot entail. Here we just focus on justifying that Bifurcation does not hold in the roots of change-of-state verbs.
2.2 Lexical semantic consequences of Bifurcation

In order to probe the meanings of change-of-state verb roots, we first focus on the adjectival structures built from the same roots. The reason is that the templates that give rise to adjectival uses of the same roots are in many cases uncontroversially void of the types of functional structure that would introduce templatic meanings such as change of state. As a consequence, looking at these uses allows us to be certain that whatever lexical entailments such adjectives have must come from the root and not some templatic head.

For clarity, we consider Embick’s (2004) analysis of the roots of change-of-state verbs and the adjectives that can be built on these roots. Although other analyses differ in (irrelevant) details, this analysis is representative of the assumptions that are needed in order to make the Bifurcation thesis work.⁴ Our point of departure is two adjectival structures. The first is the structure used for adjectives that describe “basic states.” These have a stative (precategorial) root Merging directly with an adjectivalizing morpheme called Asp in Embick’s theory. Asp crucially adds no non-vacuous templatic meaning to the event structure, its sole purpose being to make an adjective out of a precategorial state-denoting root so that it can predicate of a DP argument:⁵

(4) Basic states (aka adjectives, statives, etc.) (Embick 2004: 363)

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AspP
  Asp √ROOT
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Basic states contrast with result states, corresponding to adjectives that are (descriptively speaking) derived from verbs as in (5) and which include the functional head introducing change-of-state entailments. Embick (2004: 367) calls this head FIENT; we instead call it \( \nu_{\text{become}} \) as per §1.3:⁶

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⁴ One of the key ways in which analyses such as Hale and Keyser (2002), Baker (2003), and others differ from one another is in the syntactic nature of the root itself, and whether it is categorial (e.g. Hale and Keyser 2002) or not (Embick 2004). Theories also differ in their assumptions about the nature of the functional structure (e.g. whether entailments of causation and agentivity are bifurcated as in Pykkänen 2008 or not) and in whether any word formation is non-syntactic, among other things. None of these debates affect the key assumption, common among many theories, that change-of-state verb roots are semantically stative and thus in principle should be able to appear in contexts where no entailment of change arises (absent some combinatoric stipulations like those discussed in §2.5).

⁵ Here and throughout we have made some minor modifications to trees taken from Embick (2004) and other sources to make them consistent with the notational conventions we have introduced, primarily in indicating bar-levels on mother nodes of head-complement structures to more clearly distinguish it from adjunction and in the notation used for indicating roots. These modifications are purely notational and do not affect any of the claims being made.

⁶ Embick (2004: 363) also assumes that the Asp heads in (4) and (5) respectively may be different from one another, though it is not entirely clear why given his claim that the same morphology can realize both with result roots (e.g. crack-ed, broke-en, etc.). Any such differences that may exist, whatever
Finally, all roots of change-of-state verbs are purely state denoting on any analysis assuming Bifurcation, and only acquire an entailment of change through Merge with \( v_{\text{become}} \). That this is so is easily seen from data like (6), where it is uncontroversial that the change entailment comes from \( \text{become} \):

(6) Kim’s face became red.

Bifurcation has it that any meaning that can be introduced syntactically must be introduced syntactically. It thus follows that the entailments of change in (7a) and (7b) are also introduced syntactically, and not by the root:

(7) a. Kim’s face reddened, after the embarrassing entrance.
   b. The vase broke.

For (7a) it is sometimes assumed, as in Embick, that the –en morphology realizes \( v_{\text{become}} \). In (7b), by contrast, the assumption is that it is phonologically null. The key claim of Bifurcation, again, is that in all of (6)–(7) the change-of-state entailment is introduced in the syntax by \( v_{\text{become}} \) and not by the root, whether there is any overt morphophonological evidence for \( v_{\text{become}} \) or not.

On the assumption that Asp in (4) and \( v_{\text{become}} \) in (5) subcategorize (in whatever sense is appropriate in a given framework) for a stative root, and given that the roots of all change-of-state verbs are by necessity stative, nothing prevents the roots of all change-of-state verbs from appearing in both adjectival structures. This means that the roots of all change-of-state verbs should be found in adjectival structures both with entailments of change as in (5) and without them as in (4). With PC roots we can transparently see from their morphological structure that they do appear in both syntactic contexts. This is evidenced by the contrast between flat, which realizes (4), with a null exponent for the Asp head, and flattened, which realizes (5), with an overt –ed exponent for the Asp head (Embick 2004: 364–8). With result roots, conversely, we see no contrast. The only adjectival they might be, are irrelevant for the matters under consideration below. For this reason we simply assume the same Asp head in both cases.
forms consistently bear the morpheme –ed (and allomorphs), as with cracked. However, this does not mean they only realize the structure in (5). An alternative possibility, proposed by Embick (2004: 358), is that a form like cracked realizes both (4) and (5), with –ed being the realization of Asp in both structures, and the \( v_{\text{become}} \) in (5) simply having no phonological realization. This is in contrast with the situation with PC roots, where \( v_{\text{become}} \) is (often) realized as –en.

Summarizing, on Embick’s analysis all change-of-state roots appear in both adjectival structures, albeit differing in their morphology when they do:

\[
\begin{array}{c|cc}
 & \sqrt{\text{flat}} & \sqrt{\text{crack}} \\
\text{Basic adjective formed by (4)} & \text{flat} & \text{cracked} \\
\text{Result adjective formed by (5)} & \text{flattened} & \text{cracked}
\end{array}
\]

With this as background, we now consider three predictions about entailment behavior that a bifurcated analysis gives rise to in the domain of change-of-state verbs, ultimately arguing that the predictions are incorrect. We note at the outset that there are some complexities with the judgments on the relevant data, partly owing to issues with various tests for the relevant semantic entailments, but also partly owing to potential interference from alternative interpretations of the data in terms of what counts as a change of state and partly to some degree of speaker-to-speaker and root-by-root variation. We thus begin by giving our own judgments and those of others we have consulted for relevant illustrative roots on the appropriate readings in §2.2.1, discussing issues with the various tests as we proceed. We return to alternative interpretations and speaker/root variation in §2.2.2 and §2.2.3 respectively.

### 2.2.1 Three semantic predictions

The first semantic prediction is that morphologically basic adjectives (e.g. flat) will not entail a prior change. This is because the structure in (4) contains no \( v_{\text{become}} \) and assuming Bifurcation the root itself cannot introduce an entailment of change. This prediction is clearly borne out. For example, on the simplest analysis the corresponding inchoative for each such adjective entails that simply a change into the relevant state occurred and nothing else (the standard position going back to Lakoff 1965 and the position assumed in §1.3). If the adjective itself has no change in its meaning, then asserting the adjective while denying the inchoative verb that the state described by this adjective arose through some change: 

\[
\begin{array}{c|cc}
 & \sqrt{\text{flat}} & \sqrt{\text{crack}} \\
\text{Basic adjective formed by (4)} & \text{flat} & \text{cracked} \\
\text{Result adjective formed by (5)} & \text{flattened} & \text{cracked}
\end{array}
\]
2.2 Lexical Semantic Consequences of Bifurcation

(9)  
   a. The red dirt has not reddened.
   b. The bright photo has not brightened.
   c. The long river has not lengthened.
   d. The dark sky has not darkened.
   e. The loose rope has not loosened.

This provides some evidence that these adjectives do not entail change.

That said, some analyses of inchoatives in some languages posit that in addition to entailments of change they also have entailments of causation as well, as observed for Spanish anticausatives by Koontz-Garboden (2009a: 112–9). If that analysis applies to English inchoatives as well, it could be that discourses like those in (9) are acceptable for the wrong reason: perhaps the negation is interpreted as denial that there is a causer of the change rather than denial of the change itself. Indeed, the nature of the lexical semantics of inchoatives is very much a matter of debate (for extensive discussion see Koontz-Garboden 2009a, Horvath and Siloni 2011, 2013, Beavers and Koontz-Garboden 2013a,b, Lundquist et al. 2016) and now seem likely to be subject to crosslinguistic variation (Lundquist et al. 2016). While the simple analysis assumed in §1.3 might be reasonable for English, it is likely is not for all languages, a fact which means this diagnostic might not fully generalize. Still further, there are many change-of-state verbs for which an inchoative is unavailable altogether for reasons having to do with the lexical semantics of the verb or other idiosyncratic factors. For example, causatives whose external arguments are thematically highly specified, like agent-subject verbs such as murder, generally do not have inchoative forms (see Haspelmath 1993: 94, (16) and Levin and Rappaport Hovav 1995: 105, inter alia; see Schäfer 2009: 653 for an overview discussion and references). Similarly, sometimes an inchoative form is missing for purely idiosyncratic reasons (e.g. destroy does not have one despite otherwise fitting the profile of a verb that should). In such cases a test frame like (9) is impossible to even construct.

For both of these reasons, we should seek out additional diagnostics for the testing of an entailment of change. One possibility is to use denial of an associated passive on the reading of denial of a change, since virtually all verbs have passive forms, even those lacking inchoative forms. However, this diagnostic too must be used with care, since passives generally always entail the presence of an additional causer participant, and thus denial of the passive form always has another reading in which the denial is not of a change of state of but of some external causer of the change of state. Thus the intended reading is that no event at all of the relevant sort occurred, something that might be brought out better with a modifier such as at all or in any way:

(10)  
   a. The red dirt has never been reddened (at all/in any way).
   b. The bright photo has never been brightened (at all/in any way).
   c. The long river has never been lengthened (at all/in any way).
d. The dark sky has never been darkened (at all/in any way).
e. The loose rope has never been loosened (at all/in any way).

(on intended reading)

Here again the adjectival state may hold but an event of change denied.

A third diagnostic which we believe does not suffer from the problems of the previous two is embedding of an NP with the adjectival modifier to be tested in the frame *has never undergone a* V-ing where V is a verb derivationally related to the adjective whose inferential behavior is being tested. As the data in (11) show, this frame also leads to no contradiction with ordinary basic adjectives, again consistent with Bifurcation:

(11)  a. The red dirt has never undergone a reddening.
    b. The bright photo has never undergone a brightening.
    c. The long river has never undergone a lengthening.
    d. The dark sky has never undergone a darkening.
    e. The loose rope has never undergone a loosening.

Taken together, controlling for unwanted readings and gaps in paradigms of which verbs show which forms, these examples all do suggest that basic adjectival forms of PC roots do not entail a change. Of course, still further tests could be devised that show the same point, e.g. it is not contradictory to say *The red dirt never became red(der)*, among other things. For now we stick with the three diagnostics we have outlined here.

The second correct prediction of Bifurcation is that denial of an entailment of change with the same roots in the deverbal structure in (5) does lead to contradiction, suggesting that the deverbal structure includes \( \nu \text{become} \) and thereby the entailment of change \( \nu \text{become} \) introduces.⁷ The data in (12)–(14), using the three main diagnostics laid out above, bear this prediction out:⁸

⁷ The deverbal adjectives under discussion are participial forms, which as Kratzer (2000: 385–90) notes have two possible readings, a resultant state and a target state (building on Parsons 1990: 234–5). The distinction is described as one having to do with whether the state is reversible or not. So far as we can tell, the question of whether an adjective lexically entails a change or not is independent of the target/resultant state distinction, though the states we are interested in are largely if not entirely target states. We therefore do not discuss this distinction here.

⁸ We use attributive modification here, though Embick (2004: 357, fn. 1) suggests that this is complicated by the fact that participles generally show both adjectival (qua stative) and passive (qua eventive) senses as seen in predicative positions, though in predicative position these two readings can be disambiguated and thus controlled for. For attributive modification the relevant disambiguation strategies are not available, yet we are interested only in the adjectival reading. However, if purely adjectival uses exist in general, and attributive position is an independently known adjectival position, then regardless of the availability of passive participle senses adjectival participle senses should be possible here as well, yet no acceptable readings of the relevant diagnostics are possible. Still, we could instead reconfigure the diagnostics to use predicative constructions as part of relative clause modifiers, with present tense copulas to push the reading toward an adjectival one. In such cases the judgments
(12)  a. #The reddened dirt has not reddened.
     b. #The brightened photo has not brightened.
     c. #The lengthened river has not lengthened.
     d. #The darkened sky has not darkened.
     e. #The loosened rope has not loosened.

(13)  a. #The reddened dirt has never been reddened (at all/in any way).
     b. #The brightened photo has never been brightened (at all/in any way).
     c. #The lengthened river has never been lengthened (at all/in any way).
     d. #The darkened sky has never been darkened (at all/in any way).
     e. #The loosened rope has never been loosened (at all/in any way).

     (on intended reading)

(14)  a. #The reddened dirt has never undergone a reddening.
     b. #The brightened photo has never undergone a brightening.
     c. #The lengthened river has never undergone a lengthening.
     d. #The darkened sky has never undergone a darkening.
     e. #The loosened rope has never undergone a loosening.

In contrast to the clearly acceptable readings of basic PC root adjectives in these contexts, deverbal PC root adjectives sound awkward in all of them.

The final prediction of Bifurcation is that since adjectives based on result roots are structurally ambiguous between the templates in (4) and (5) they will not entail prior change since in any particular context the adjective could be realizing (4), which lacks \textit{v} \textit{become} and therefore a change entailment. Crucially, this prediction is not borne out—such adjectives generally do entail a change of the kind described by the verb they are derivationally related to (Koontz-Garboden 2005, 2010, Deo et al. 2011). Here we focus on \textit{shatter}, \textit{crack}, \textit{murder}, \textit{barbecue}, and \textit{cook}. For these the inchoative test only applies to some of them—\textit{murder} does not have an inchoative, and for many speakers \textit{barbecue} does not either. For the other verbs, denial of the inchoative while asserting the seemingly deverbal adjective yields a contradiction:

(15)  a. #The shattered vase has never shattered.
     b. #The cracked bowl has never cracked.
     c. #The cooked chicken has never cooked.

Less complicated are the passive and \textit{undergone a V} \textit{ing} diagnostics, both of which clearly show that adjectives based on result roots do entail change:

are the same (e.g. #The dirt that is reddened has not reddened), suggesting that this is not an influence on the data. We thus continue to use attributive modification.
(16) a. #The shattered vase has never been shattered (at all/in any way).
    b. #The cracked bowl has never been cracked (at all/in any way).
    c. #The murdered man has never been murdered (at all/in any way).
    d. #The barbecued chicken has never been barbecued (at all/in any way).
    e. #The cooked chicken has never been cooked (at all/in any way).

(17) a. #The shattered vase has never undergone a shattering.
    b. #The cracked bowl has never undergone a cracking.
    c. #The murdered man has never undergone a murdering.
    d. #The barbecued chicken has never undergone a barbecuing.
    e. #The cooked chicken has never undergone a cooking.

Thus it seems that adjectives formed from result roots entail change.

A potential objection is that this is a matter of context. Setting aside the
continuing context, what does it mean to describe something with the attributive
adjectives shattered or murdered or barbecued? The contexts here do not establish
this, and perhaps absent appropriate context these sentences are all deemed
unacceptable because the same surface term is juxtaposed twice, once asserted and
once negated (in contrast with PC roots above, where there is a separate form for
the basic stative that clearly indicates the relevant state without a change). But if
we can isolate what the relevant states are that lack change and embed sentences
such as these in contexts that clarify that these states hold, then under Bifurcation
they should be acceptable. Our claim, of course, is that whatever the states are
these roots entail that a change gave rise to them, and thus there will always be
a contradiction with any context in which a change does not occur. However, if
Bifurcation is correct then there must be some state not arising from a change that
corresponds to these adjectives. Perhaps the clearest methodology for identifying
such a state would be that the relevant state must be one that has the appearance of
having arisen by an event of the sort described by the verbal form. For example, if
one shatters a ceramic vase, then the vase will end up in numerous pieces, and as
such if one sees ceramic pieces whose composition is such that they would appear
to form a vase if put together in the right way, one might assume it is a shattered
vase regardless of whether one assumes any event led to it.

However, even in a context where a vase is somehow made to be in a state
that otherwise might be called shattered—if an artist prepares numerous ceramic
pieces that are carefully sculptured so that they could be assembled into a vase but
nonetheless never are—it is difficult to describe the collection of pieces as shattered
or a shattered vase, and certainly (16a) does not felicitously describe this situation.
Similar contexts for cracked do not improve the readings (though see §2.2.2 for
a potential complication that might affect the interpretation cracked and other
verbs in Levin's break class regarding readings of change across space rather than
time). As for (16c-e) it is difficult for us to even conceive of analogous scenarios where someone may be deemed murdered or something deemed barbecued or cooked when the actions described by murder, barbecue, and cook respectively did not occur, effectively supporting our point that the adjectives themselves entail a change and this explains the contradictoriness of (16c-e). For cooking verbs perhaps the relevant state is something about the relative textural and chemical properties of the food and/or its temperature and edibility, though if (say) a substance is chemically synthesized in a lab to have the relevant properties of barbecued chicken, (16d) still sounds odd. For murdered, if we found a seemingly dead body surrounded by evidence of a violent, externally caused death but in fact the body was stitched together from amputated body parts, then (16e) is not a felicitous description. The same facts all apply to (17) as well.⁹

Finally, this same split in entailment behavior of PC versus result roots has been replicated for other languages (see Jerro 2017b on Kinyarwanda, Valle et al. 2017 on Kakataibo, Spathas 2017 on Greek, and Beavers et al. 2018 on Hebrew and Marathi; we discuss Spathas’s data in §2.4.1). This suggests that this distinction is not just a matter of English but is something that can be found for the same root classes in other languages as well, even controlling for context. In sum, even beyond verbal contexts result roots but not PC roots give rise to an entailment of change, suggesting that this entailment is part of the root meaning and not introduced templatically despite being one that is canonically considered templatic, namely the entailment introduced by vbecome (or other functional heads in other, related frameworks). We now turn to two complications with these judgments that must be taken into account.

2.2.2 Entailments of change in derived statives

Notwithstanding judgments like those above, there have been documented in English and other languages what Nedjalkov and Jaxontov (1988) (and papers in that collection) call in their typological survey “derived statives”—deverbal adjectives that fail to entail there was any temporal change giving rise to the described state.¹⁰ On the surface, such examples look like precisely the kinds of

⁹ An alternative test might use the active transitive as in The vase is shattered but nobody shattered it, which is acceptable. However, the subject here is human-denoting nobody, yet not only human agents but also events, states, inanimates, and other kinds of entities can cause changes of state events (e.g. The earthquake/the hammer shattered the vase). The reading with nobody is most naturally a denial that it was a human that led to the shattered state, not that there was no shattering event at all, and thus such data do not argue against shattered entailing a change. It is for reasons of avoiding such confounds that we have generally avoided contradictions in which a cause is explicitly expressed, especially when the negation is expressed as a quantifier over the causer as with nobody, for which a denial of causation reading is especially salient.

¹⁰ See also Dubinsky and Simango (1996) for discussion of similar facts in Chichewa and their analytical consequences, which we believe are incorrect given the observations in Koontz-Garboden (2010) and Deo et al. (2011).
data predicted by Bifurcation. Consider (18), where it is clear the lines in question, given the nature of standard writing paper, do not undergo any temporal breaking event to come to be in the state described by *broken*:

(18) …this paper provides a guide for writing letters that extend below the baseline. Internal broken lines serve as a reference for writing half-space letters. <http://nwccog.co.networkofcare.org/aging/assistive/list.aspx?indexingterms=writing-paper> (Accessed May 11 2018)

This might lead one to conclude that result roots, like PC roots, do not actually entail change in their adjectival forms. However, there are several observations to make about such examples, all of which clearly indicate that data such as this do not support this conclusion.11

First, there is clear evidence that these adjectives are in fact derived from verbal uses that have the same interpretation, since for each such use there is a corresponding verbal usage that also fails to entail change in time. Consider (19), which is clearly temporally stative given the non-habitual present tense use of the verb (see Dowty 1979: 55–6 for discussion of non-habitual readings of the English present tense as diagnostic of stativity):

(19) ONE suggestion on ur story, it’s hard to read when the line suddenly breaks off and u hav to go down a line in the middle of a sentence, to make it flow easier …

Thus it might not be anything to do with adjectives like *broken*; it could instead be that the root itself entails no change. However, despite the stativity of (19) it can be shown with straightforward contradiction tests that such uses do entail change, albeit that the change is not temporal in nature.

Rather, as recent work has demonstrated changes of state can also be measured along dimensions other than time, including change measured along space (Gawron 2009, Koontz-Garboden 2010) and even change measured across non-temporal and non-spatial domains such as change across populations of individuals (Deo et al. 2013). This can be seen in (19) from the fact that this example takes an adverbal modifier that selects dynamic predicates, in particular *suddenly*. The non-temporal change in such verbs can be seen more clearly by examining such forms based on PC roots like √wide. Consider, for example, a situation

11 Although more work is needed, it seems possible that these observations extend to similar phenomena that have been observed in other languages, e.g. Greek (Alexiadou and Anagnostopoulou 2008) and Hebrew (Doron 2009), though we leave this for future work.
in which a road is constructed so that it is wider at some points than at others. Such a situation can be described with a present tense verb form in English, hence indicating temporal stativity:

(20) I65 widens up ahead.

Notwithstanding the temporal stativity, there is no question that the verb is dynamic, i.e. that it entails of the eventuality it describes that there is change in the road over space. This can be seen from a variety of facts. First, analogous with (19), it can be modified by adverbs like quickly, which can modify only dynamic predicates:

(21) I65 quickly widens up ahead.

Here the reading is that the spatial transition does not take a lot of space. Additionally, when contrasting the deverbal adjective with the morphologically basic one that the verb is derived from a contradiction can be generated with the former but not the latter by denying that there was a change in the eventuality described by the predicate—a standard test for entailment of change (Koontz-Garboden 2010, Beavers 2011b; see also Chapter 4):

(22) a. I65 is wide at Lafayette city center. In fact, it’s of the same width for its entire extent.
    b. #I65 is widened at Lafayette city center. In fact it’s of the same width for its entire extent.

The key observation is that while change-of-state verbs entail change in some domain, it need not be change in time (see Koontz-Garboden 2010, Deo et al. 2013 for further discussion). This leads to the possibility of stative verbs of change of state in both PC and result roots, and thus that adjectives derived from these verbs may have stative change-of-state readings as well.

With this as background, we now return to examples like (18) with result roots. With such roots there is no contrasting morphologically basic adjective counterpart like (22a) (as we noted above). However, it is nevertheless clear that denial of an inference of change in spatial change contexts with result root adjectives (like (18)) leads to contradiction, showing that they entail change even if the change is not temporal. In order to see this, consider the broken line example from (18) in a context where gaps in a line are labeled with letters for ease of reference, as shown using a double line in (23). Crucially, broken can be asserted of a double line if some portions of a double line are preceded by but separated from other portions of the double line by a gap. Thus (23a) is acceptable in such
70 ENTAILMENTS OF CHANGE IN ROOTS

a context, given that spatially prior to point W there is another portion of double line. If we consider a portion of double line at which there is no prior double line, however, as in (23b), the assertion that the double line is broken at that point is sharply infelicitous:

(23)  

(a) \[ \begin{array}{c} \hline \ \ \ \ W \ \ \ \ \hline \end{array} \]  

The double line is broken at W.

(b) \[ \begin{array}{c} \hline \ \ \ W \ \ \ \ \hline \end{array} \]  

#The double line is broken at W.

Similar examples can be found with others of Levin’s (1993: 241–2) *break* verbs. For example, there is no sense in which the *heart* in (24) underwent any temporal tearing:

(24) Chesko, 17, was born with a torn valve in his heart. Instead of closing, it flaps, so as the organ pumps, some of the blood returns to the heart rather than leaving it and circulating in the body.  

Much as with the *break* data, however, it does not follow from (24) that *torn* is not semantically (and morphologically) deverbal. Indeed, there are verbal uses of *tear* as in (25) that are also clearly stative and also fail to have any entailment of temporal change:

(25) You bread photos are great. Is there a trick in making the cuts so that your bread tears at the cuts like your french loaves and not elsewhere. Many times mine will just open up but flatten out but it [sic] they tear it is on one side near the bottom.  

Just as with the *break* examples discussed above, while (25) does not entail change in time it does entail change, albeit change in space. The same is true for deverbal adjectival examples like (25), a fact which can be shown with a contradiction test, as in (26):

(26) #The bread is torn at the cut. In fact, it is in two pieces.

In spite of the fact that there is no temporal tearing in (26), that there is some change from attached to unattached is entailed.
In sum, while adjectives based on break roots have uses that fail to entail temporal change, all such adjectives entail change along at least some dimension beyond time where change can be measured out. Interestingly, as noted by Koontz-Garboden (2010: 299), cooking roots do not allow such uses. Of the data in (27), for example, Koontz-Garboden observes that (27a) is acceptable in a situation where the entire side of beef in the stipulated location undergoes a cooking in time. However, (27b) is unacceptable in a situation where the side of beef has different degrees of cookedness at different spatial points along it, e.g. with the joint being more cooked than the rib at a single point in time. As Koontz-Garboden notes, (27b) is unacceptable in virtue of the use of the present tense verb form, which requires stativity. The verb cook, however, has no temporally stative use like the stative but spatially dynamic uses of other change-of-state verbs illustrated in (22)–(26):12

(27)  a. The side of beef is cooking between the rib and the joint.
      b. #The side of beef cooks between the rib and the joint.
  (Koontz-Garboden 2010: 299)

Cooking verbs (and killing verbs, we also believe) strictly entail temporal change; atemporal change contexts are impossible with them, suggesting that roots can not only entail change but also select for the kind of change they entail. This is an observation whose consequences we will return to below.

2.2.3 Sources of variation

A second complication has to do with variation in judgments across speakers and for different roots among the PC and result classes above. For example, with broken in particular, our judgments are that it is unacceptable in the frames in §2.2.1, suggesting that it entails a change:

(28)  a. #The vase is broken but it didn’t break.
      b. #The vase is broken but it has never been broken.
      c. #The vase is broken but it did not undergo a breaking.

Although (28) are contradictory for us, several speakers have pointed out to us that for them broken admits a reading wherein something can be manufactured in a broken state (e.g. predicting that The vase was made broken can have a meaning

12 Of course, it is possible that a temporal change can give rise to differences across space, as might be the case in (27a) if the temporal change results in different degrees of cookedness across the side of beef. In such a case there are differences across space that are the artifact of a temporal change. But this does not make (27a) a case of spatial change.
wherein it was manufactured in that state and there was no particular event that led to that state coming about). If so, the prediction is that for such speakers (28) should be acceptable. In fact, we do not rule out the possibility that some English speakers might find them acceptable (and similarly for other result roots). In particular, there are at least two reasons consistent with our analysis for why this might be the case.

First, it is conceivable that change across space or population readings along the lines of those discussed by Deo et al. (2013) for degree achievements as in §2.2.2 might extend to these cases as well (e.g. see the discussion of spatial broken above). A possible reading then is that the vase has some crack or other defect in it as one moves across a spatial dimension, or represents a class of vases across populations of vases going from not broken to broken, but there was no temporal change that led to this. If so, then there is a change here, but the non-temporal change has created a confound.

A second possibility is that there could be a diachronic process of bleaching or other semantic drift that has led to mismatches between morphology and change-of-state entailments, so that at least some adjectives that are superficially deverbal, over time, become fixed, lexicalized expressions while also losing their entailments of change. Such is clearly the case with closed, for example, which does not entail a prior closing, as evidenced by data such as the following:

(29) The door was built in a closed position, but has never undergone a closing.

As far as we are aware closed is an example of a result root in the morphological sense of having only a seemingly deverbal adjective for which there is also wide speaker agreement that the adjective need not entail a change (our judgments as well). Broken in turn may also have undergone lexical drift for some speakers to have a specialized meaning like “not functioning” or “not canonical in a way that suggests defects,” which could be an inherent property rather than one derived through a change. Such processes strike us as expected at the level of individual lexemes and may easily lead to some variation in judgments for particular roots (see Dowty 1979: 309–19 for an extended discussion of issues related to lexicalization and lexical drift of this sort in the context of a rule governed system of word formation; see also §4.1). Furthermore, such lexicalization differences could also exist on a speaker to speaker basis: different people may have slightly different understandings of the relevant terms.

However, what is key for us is that members of the result root group in (3) contain numerous examples of roots where it is hard to see that the adjectival forms ever have readings lacking change (e.g. a speaker who believes broken does not entail a change agrees that other such stative terms seem contradictory when denying a change). What is critical for us is simply the existence of any terms that do entail change among this group, even if not every one does either categorically
or for all speakers, since our goal is to show that counterexamples to Bifurcation exist, most specifically among result roots. Conversely, few if any basic PC root adjectives have entailments of change that we are aware of, though if any did this could also be accounted for through idiosyncratic lexical drift. In sum, we expect speaker-to-speaker and item-by-item variation, though ultimately the existence of any forms defying Bifurcation for any set of speakers is sufficient to demonstrate our point that Bifurcation does not universally hold.13

2.2.4 Summary: Predictions of Bifurcation and semantic explananda

The main conclusion from the discussion above is that there is no context in which entailments of change fail to surface with result roots. Even derived stative contexts entail that the participant the state holds of underwent some change, though it need not have been a temporal change. Furthermore, the verbs that result root adjectives are derivationally related to have these same uses. This entailment of change (temporal or otherwise) distinguishes result roots from PC roots, which are clearly found (in their morphologically simple form) without a change entailment of any kind—inferrings of temporal and atemporal change can be readily denied with PC roots in their morphologically simple form without giving rise to contradiction. The fact that many result roots generally cannot be disembodied from an entailment of change in any context, while PC roots can, suggests that the former by contrast with the latter have this as part of their root meaning (modulo some speaker-to-speaker and root-by-root variation). Furthermore, we have observed that roots can select for particular kinds of change, with some roots, like crack, break, etc., underspecified for the type of change, while cooking and killing roots lexically specify for temporal change only.

13 The claim that some roots entail change does not preclude “fun with language” examples where no change has occurred. These are cases in which some object is described as a thing that it is meant to resemble. For example, a reviewer points to Massimo Bottura’s recipe “Oops! I dropped the lemon tart” <http://www.epicurious.com/recipes/food/views/oops-i-dropped-the-lemon-tart-51198010>, for a dessert that is meant to look like a lemon tart that has been dropped, broken up, and is a mess on the plate. That the dessert has not undergone a dropping event in space, time, or presumably any dimension is irrelevant, we believe, as this is simply a name, much in the way a work of art might have a name evoking what the art is meant to represent. Thus a sculpture might be inspired by a storm on a hill and be given the name “Storm on a hill” by the artist creating it, even though it is clearly neither a storm nor a hill. We believe this dessert case is parallel, in that it is arguably neither a tart nor certainly dropped, but rather inspired by what a real dropped lemon tart might look like. Such fun with language is entirely normal, but irrelevant for the matters at hand.
This gives rise to the semantic typology in (30), which any theory of the syntax/semantics of change-of-state verbs must find a way of capturing:

<table>
<thead>
<tr>
<th>Root type</th>
<th>Change entailments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC roots</td>
<td>no change entailed</td>
</tr>
<tr>
<td>break-roots</td>
<td>change of any kind entailed</td>
</tr>
<tr>
<td>cook- and kill-roots</td>
<td>temporal change entailed</td>
</tr>
</tbody>
</table>

This typology (and the more basic one of PC vs. result roots) in turn leads to a predictive typology of verbs based on these different roots, something that is crucially rooted solely in differences in root meaning and nothing to do with the templates these roots occur in. In §§2.4–2.5, we return to the typology in (30) to consider its consequences for Bifurcation and the architecture of an adequate theory of change-of-state verbs. First, however, we consider what Bifurcation entails for the morphological shape of change-of-state verbs and derivationally related words.

### 2.3 Morphological consequences of Bifurcation

2.3.1 Four morphological predictions

Bifurcation in the context of change-of-state verbs also predicts that, modulo language and root-specific morphological accidents, words derived from the roots of all change-of-state verbs should be identical in morphological complexity. This is because what defines change-of-state verbs is the presence of the same templatic operators in the same arrangement, and these operators should in the general case have the same exponence across all roots. Consider, for example, the Embick-style structures for basic adjectives, result state adjectives, inchoatives, and causatives introduced above and repeated in (31):

(31)  

a. Basic states (e.g. adjectives, statives, etc.) (Embick 2004: 363)  

$$  \begin{array}{l}  
\text{AspP} \\
\text{Asp} \\
\text{Asp} \\
\text{Asp} \\
\text{Asp} \\
\end{array}  $$

b. Result states (Embick 2004: 367)  

$$  \begin{array}{l}  
\text{AspP} \\
\text{Asp} \\
\text{Asp} \\
\text{Asp} \\
\text{DP} \\
\end{array}  $$
2.3 Morphological Consequences of Bifurcation

Inchoatives (Embick 2004: 365; see also §1.3.1, (21b))
\[
\begin{array}{c}
\text{DP} \\
\text{v' become} \\
\text{\sqrt{RO}OT}
\end{array}
\]

Causatives (Embick 2004: 366; see also §1.3.1, (21c))
\[
\begin{array}{c}
\text{DP} \\
\text{v' cause} \\
\text{v' become} \\
\text{\sqrt{RO}OT}
\end{array}
\]

Since all adjectives, inchoatives, and causatives are formed in the same way, with the same operators in the same arrangement, then all things being equal these operators should have the same realization across root classes. For example, internal to a single language \(\text{v' become}\) should be realized the same way (or perhaps in one way for inchoatives, one way for causatives, and one way for deverbal adjectives), Asp the same way (or at least in two different ways), and similarly for all templatic operators. In short, internal to a single language all inchoative and causative change-of-state verbs should be identical in morphological complexity and overt form, as should their corresponding adjectives, since what makes any root into an adjective, inchoative, or causative is the same templatic operator/functional head across all roots of change-of-state verbs. These predictions are articulated in (32):

(32)  
\begin{enumerate}
  \item Basic adjectives from all roots have the same complexity and morphological forms
  \item Result adjectives from all roots have the same complexity and morphological forms
  \item Inchoative change-of-state verbs derived from all roots have the same complexity and morphological forms
  \item Causal change-of-state verbs derived from all roots have the same complexity and morphological forms
\end{enumerate}

This does not preclude the possibility that there are principled patterns of subregularity. For example, verbs of personal grooming such as \textit{shave} or \textit{dress} are arguably change-of-state verbs, yet tend to form special morphological subclasses in many
languages (as middle voice verbs, often marked as reflexive in languages; see e.g. Kemmer 1993: 54–5), and we might expect other types of principled subregularity rooted in semantics (e.g. see also potential morphological and syntactic distinctions between verbs based on the internal vs. external caused distinction of Levin and Rappaport Hovav 1995: 91 or the agent-subject vs. causer-subject distinction as per Van Valin and Wilkins 1996 and Koontz-Garboden 2009a, *inter alia*).

However, if we assume Bifurcation, then the PC vs. result root distinction as a fact about semantics wherein the former roots do not entail a change and the latter do is not a possible distinction. Thus absent any other way of distinguishing these two root classes (some such proposals for which we discuss and dismiss in §2.5) the expectation is that the roots in these two classes should in the general case have the same morphological properties. Of course, within any (sub)class of words the morphology for any individual item may be idiosyncratic and exceptional owing to factors such as historical accidents, and thus there could be quite a lot of individual variation. However, it should be the case that any such deviation within a given root (sub)class should be random. Thus to the extent that PC and result roots show distinct, recurring morphological distinctions Bifurcation is called into question. Whether this is true in relation to (32c,d) remains a somewhat open question, though preliminary data from Eastern Armenian (Megerdoomian 2002), Hebrew (Doron 2003), Greek (Alexiadou and Anagnostopoulou 2004), and Ulwa (Koontz-Garboden 2006) all suggest that PC roots and result roots do indeed differ in their morphological marking in the causative alternation, at least in those languages. This question is investigated in a more systematic way in Beavers et al. (2018), drawing on the same crosslinguistic sample described further below. The results there point in the direction of falsification for (32c,d). We do not deal with these predictions further here, referring the interested reader instead to Beavers et al. (2018). Instead we focus in more detail on (32a,b).

### 2.3.2 Adjectives derived from the different root classes across languages

Contrary to the prediction of Bifurcation, as already seen above adjectives derived from the roots of English change-of-state verbs are not morphologically homogeneous. While there are two kinds of adjectives derived from PC roots (morphologically basic and deverbal), from result roots there is only one, which superficially seems to be deverbal (and behaves that way semantically; see §2.2). Any the-

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14 Alternatively, morphological differences among verbs may be conditioned purely by phonology, though for the moment we set this aside since such facts would be language particular and for English there is no obvious consistent phonological distinction between result and PC roots.
ory preserving Bifurcation must treat the English situation as a morphological accident, since, again, the same templatic operators are at play with the roots of all change-of-state verbs. This is precisely what Embick (2004: 363) proposes. Specifically, Embick claims that in English, adjectivalizing morphology (–ed and its allomorphs) realizes the Asp head in both (4) and (5) with result roots, while Asp with PC roots is realized differently in the two structures—null in (4) and overt in (5). The contrast between the two root types is thus an accident of English morphology.

This is in principle a plausible account of English—it just happens that what we are calling PC roots are those that fall into one morphological class and what we are calling result roots are those that fall into another. However, there are two complications with this. First, the morphological accident happens to correlate with a recurring semantic difference discussed in §2.2.1, where basic PC root adjectives systematically lack change-of-state entailments but categorically marked result root adjectives often entail change. This suggests that the morphological distinction might be tied to other properties of these roots. Furthermore, since morphological accidents are by definition language- and root-specific (see discussion and references in Koontz-Garboden 2016: 96–7) such an analysis predicts that the same kind of morphological split between PC and result roots should not repeat itself in other languages. As it turns out, there have been various isolated observations in unrelated languages of morphological contrasts of just this type in prior literature. For example, the data in (33) from Megerdoomian (2002) show that just like English, many Eastern Armenian roots lack an adjective of the same kind of morphological form as that describing the basic state for PC roots:

(33) a. Eastern Armenian PC verbs (Megerdoomian 2002: 98)

<table>
<thead>
<tr>
<th>adjective</th>
<th>non-causative COS</th>
<th>causative COS</th>
</tr>
</thead>
<tbody>
<tr>
<td>layn 'wide'</td>
<td>layn.anal 'widen'</td>
<td>layn.ats.nel 'widen'</td>
</tr>
<tr>
<td>ċor 'dry'</td>
<td>ċor.anal 'dry'</td>
<td>ċor.ats.nel 'dry'</td>
</tr>
<tr>
<td>metz 'big'</td>
<td>metz.anal 'grow'</td>
<td>metz.ats.nel 'grow, bring up'</td>
</tr>
<tr>
<td>arag 'fast, quick'</td>
<td>arag.anal 'quicken'</td>
<td>arag.ats.nel 'accelerate'</td>
</tr>
<tr>
<td>čaq 'fat'</td>
<td>čaq.anal 'become fat'</td>
<td>čaq.ats.nel 'fatten'</td>
</tr>
<tr>
<td>sev 'black'</td>
<td>sev.anal 'blacken'</td>
<td>sev.ats.nel 'blacken, darken'</td>
</tr>
</tbody>
</table>

b. Eastern Armenian result verbs (Megerdoomian 2002: 98)

<table>
<thead>
<tr>
<th>adjective</th>
<th>causative COS</th>
<th>non-causative COS</th>
</tr>
</thead>
<tbody>
<tr>
<td>k’ot’Rel 'break'</td>
<td>k’ot’R.v.el 'break'</td>
<td></td>
</tr>
<tr>
<td>epel 'cook'</td>
<td>ep.v.el 'cook'</td>
<td></td>
</tr>
<tr>
<td>poxel 'change'</td>
<td>pox.v.el 'change'</td>
<td></td>
</tr>
<tr>
<td>xort’ak’el 'sink, drown'</td>
<td>xort’ak’.v.el 'sink, drown'</td>
<td></td>
</tr>
</tbody>
</table>
Koontz-Garboden (2006, 2009b, fieldnotes) notes a similar contrast in Ulwa:

(34) Ulwa (Koontz-Garboden 2006; fieldnotes)

a. “deadjectival” verbs

<table>
<thead>
<tr>
<th>state</th>
<th>non-causative COS</th>
<th>causative COS</th>
</tr>
</thead>
<tbody>
<tr>
<td>pau– ‘red’</td>
<td>pau-ta– ‘redden’</td>
<td>pau-ta– ‘redden’</td>
</tr>
<tr>
<td>yam– ‘good’</td>
<td>yam-pa– ‘become better’</td>
<td>?</td>
</tr>
<tr>
<td>dut– ‘bad’</td>
<td>dut-ta– ‘get worse’</td>
<td>?</td>
</tr>
</tbody>
</table>

b. break verbs (unmarked meaning of root in –ta/pa–; Koontz-Garboden 2009b)

<table>
<thead>
<tr>
<th>state</th>
<th>non-causative COS</th>
<th>causative COS</th>
</tr>
</thead>
<tbody>
<tr>
<td>∗ bah-wa– ‘break (intrans)’</td>
<td>bah-ta– ‘break (trans)’</td>
<td></td>
</tr>
<tr>
<td>∗ lah-wa– ‘boil (intrans)’</td>
<td>lah-ta– ‘boil (trans)’</td>
<td></td>
</tr>
<tr>
<td>∗ birh-da– ‘tear (intrans)’</td>
<td>birh-pa– ‘tear (trans)’</td>
<td></td>
</tr>
<tr>
<td>∗ bis-da– ‘rip (intrans)’</td>
<td>bis-pa– ‘rip (trans)’</td>
<td></td>
</tr>
</tbody>
</table>

Similar data can be observed in Pima (Smith 2006: 3), Tongan (Koontz-Garboden 2005), O’odham (Hale and Keyser 1998: 92), Kakataibo (Valle et al. 2017), and Kinyarwanda (Jerro 2017b). Thus a PC vs. result root split is attested beyond just English, suggesting the distinction might be linguistically significant. That said, convenience data from a few languages, while suggestive, do not amount to a fully systematic investigation.

However, in recent work Beavers et al. (2018) show beyond doubt that the prediction of Bifurcation that there should be basic adjectives based on both root types is false. Using a combination of dictionary and grammar mining plus some native speaker work (building on methodologies used by Croft 1990, Haspelmath 1993, and Nichols et al. 2004), Beavers et al. collected paradigms of basic stative, inchoative, causative, and result stative forms (e.g. red-redden-redden-reddened) for 72 total root meanings, 36 PC root meanings (drawing on Dixon’s (1982: 16) major property concepts) and 36 result root meanings (drawing on Levin’s (1993) non-deadjectival English verb classes) in a balanced sample of 88 languages largely drawn from the WALS-100 list (Comrie et al. 2013). The relevant root meanings are given in (35) and (36) (as an adjective or verb, with synonyms or hypernyms considered in that study given in parentheses) (Beavers et al. 2018: (3)–(4)):

(35) Property Concept Roots

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

¹⁵ A preliminary version of the study is reported in Beavers et al. (2017).
2.3 MORPHOLOGICAL CONSEQUENCES OF BIFURCATION

b. Age: old/aged/age
c. Value: bad/worsen/worse, good/improve/improved
d. Color: white/whiten, black/blacken, red/redden, green/make green, blue/make blue, brown/make brown
e. Physical Property: cool/cool, cold/make cold, warm/warm, hot/heat up, dirty/dirty, dry/dry, wet/wetted, straight/straighten, hard/harden (tough/toughen), soft/soften, tight/tighten, clear/clear, clean/clean, smooth/smooth, sharp/sharpen, sweet/sweeten, weak/weaken, strong/strengthen
f. Speed: fast/speed up, slow/slow down

(36) 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

Beavers et al. (2018) demonstrate a robust difference already suggested by the preliminary data observed in previous language-specific studies discussed above: while PC root meanings are overwhelmingly associated with basic stative forms (nearly all PC roots where at least one member of the paradigm was attested had an attested basic stative form), there are rarely basic stative forms associated with result root meanings (almost no result roots where at least one member of the paradigm was attested had an attested basic stative form), a statistically significant
result.⁶ Taken together the evidence from the language particular studies cited above and the broader typological study of Beavers et al. (2018) suggest that there is a general crosslinguistic tendency for PC roots and result roots to differ in morphological ways that is not consistent with a Bifurcation.

2.3.3 Summary: Predictions of Bifurcation and morphological explananda

Contrary to the prediction of Bifurcation, there seems to be a systematic contrast between PC roots and result roots in that state-denoting words based on result roots do not exist in the same morphological forms as those based on PC roots. In short, the Bifurcation Thesis misses a significant morphological generalization. It predicts that any difference in the morphological shape of state-denoting words derived from PC roots and result roots should be purely accidental. The crosslinguistic repetition of the pattern shows unambiguously, however, that it is not. This suggests that the distinction is linguistically significant, and combined with the correlating semantic observation discussed above strongly suggests that the relevant basis for the distinction is that PC roots do not entail change but result roots do, contra Bifurcation.

2.4 Analytical option 1: Abandon Bifurcation

In the preceding sections we examined semantic and morphological predictions of Bifurcation in the domain of change-of-state verbs. Contrary to the predictions that all change-of-state verbs should behave identically in both domains, we have observed significant contrasts between subclasses of such verbs. First, while PC roots can be disembodied from an entailment of change, result roots never can be. Second, result roots contrast among themselves in the kinds of change they lexically entail. Third, result roots and PC roots contrast in the morphological contexts in which they can appear. We now consider the consequences of these observations for the Bifurcation Thesis and the kinds of analyses these facts motivate. We begin with analyses that would break with Bifurcation, as we believe the facts necessitate. We then turn to a discussion of how it could be maintained and the empirical and theoretical consequences of doing so.

⁶ There are some noteworthy counterexamples around the edges discussed by Beavers et al. (2018), which ultimately have explanations consistent with the overall observations. Beavers et al. furthermore show that the statistical results hold up even controlling for various issues that arise in typological studies of this sort owing to data spareseness, e.g. controlling for the possibilities of translation bias that might affect how stative terms are coded and for lack of attested terms in lexical resources in the face of known productive processes for deriving terms of the appropriate sort.
2.4 ANALYTICAL OPTION 1: ABANDON BIFURCATION

2.4.1 A purely non-lexicalist analysis

As we discussed in §1.3, much recent work on verbs at the syntax/semantics interface is conducted in the context of various non-lexicalist theories, including in particular Distributed Morphology (DM), in which Bifurcation was originally couched. However, the two can certainly be decoupled, so that an analysis in which all word formation is syntactic and based on acategorial roots is possible to maintain while still rejecting Bifurcation. In this section we develop the outlines of such an analysis.

The starting point is precisely the assumption that violates Bifurcation—that at least some result roots come with an entailment of change, while PC roots do not. In its most straightforward formulation, this would be to assume that a root like √flat denotes a relation between theme arguments and states of flatness, where the flat relation does not have as part of its truth conditional content anything to do with change, whereas √crack says of its theme that it is related to a state s of having some fissure in its material integrity—for simplicity we represent this as a state cracked, though this is just a mnemonic logical symbol and not meant to be equated with the English participle—and furthermore requires that there be some eventuality e′ that led to this state of affairs. To capture that both spatial and temporal change readings are possible we assume (as already mentioned in §1.3.2, fn. 8) that become′ may take either a proper event as the eventuality of change, which would result in temporal change, or a state, in which case the change occurs over a spatial region or a population:

\[ \text{(37)} \]
\[
\begin{align*}
\text{a. } & [\sqrt{\text{flat}}] = \lambda x \lambda s [\text{flat}′(x, s)] \\
\text{b. } & [\sqrt{\text{crack}}] = \lambda x \lambda s [\text{cracked}′(x, s) \land \exists e′ [\text{become}′(s, e′)]]
\end{align*}
\]

In reality the existence of an entailment of change is probably best thought of as being part and parcel with what it means to be in the state that cracked describes in the appropriate sense, i.e. it is a fact about how we conceive of the kinds of states that such result roots describe independent of their linguistic expression and thus should follow as part of the truth conditions imposed by the formative cracked′ that defines the idiosyncratic contribution of this root (e.g. ∀x∀s[cracked′(x, s)]

---

\(^{17}\) This kind of analysis presupposes that atemporal dynamic eventualities are states, as evidenced by their temporal stativity, as discussed above (see also Kratzer 2000: 392–3 for a similar observation). See Gawron (2009) and Koontz-Garboden (2010) for discussion of how atemporal change upends the traditional event/state dichotomy. That said, what we are proposing here is not meant to be a fully-fledged analysis of the temporal vs. atemporal change distinction, which is beyond the scope of the present work but will involve ultimately imposing conditions on the kinds of entities a become′-type relation entails that the change described by the verb occurs along and what that relationship is (e.g. a Figure/Path Relation as for events of change as in §1.6.1, or something else; see Deo et al. 2013 for a more fleshed out theory). However, the details will not matter here and thus we adopt this simplification as a placeholder.
\(\neg\exists e'[\text{become}'(s, e')])\). As such it need not be listed separately per se. However, for clarity here and below we continue to represent it as a separate part of the meaning of the root so as to make the contrast with PC roots clearer. (See §5.2 for further discussion.)

Assigning the change-of-state head \(v\text{become}\) has a denotation as in (38) and combining it with the roots in (37) derives the inchoative predicates for the contrasting root classes in (39a,b):

(38) \[ [v\text{become}] = \lambda P\lambda x\lambda e\exists s[\text{become}'(s, e) \land P(x, s)] \] \(=(22b)\) in §1.3.2

(39) a. \[ [[v\text{become}\sqrt{\text{flat}}]] = \lambda x\lambda e\exists s[\text{become}'(s, e) \land \text{flat}'(x, s)] \]

b. \[ [[v\text{become}\sqrt{\text{crack}}]] = \lambda x\lambda e\exists s[\text{become}'(s, e) \land \text{cracked}'(x, s) \land \exists e'[\text{become}'(s, e')]] \]

The formulae (39a,b) are identical in their lexical entailments save for the final state. But for result roots the root itself already lexically entails the existence of the change independent of \(v\text{become}\). It is not problematic that \(v\text{become}\) and \(\sqrt{\text{crack}}\) both introduce an entailment of change. The relevant meaning components are conjoined and thus though they are introduced separately the result is truth-conditionally equivalent to change being introduced just once. By contrast, such an entailment is only found in words built on PC roots when \(v\text{become}\) is first composed with the root. In either case, when combined with \(v\text{become}\) the two resulting verbal forms are identical in entailing change.

This analysis makes two key semantic predictions about where the roots diverge. First, it predicts there can be no adjective formed with a result root lacking the entailment of change, in contrast with a PC root. This prediction, which is borne

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18 This analysis bears some similarities to Kratzer’s (2000) analysis of German stative participle formation. In particular, she also proposes (pp. 390–1) a class of acategorial roots that entail both a state and change, the ones in German that form target state participles (e.g. \(\text{auf-pumpen} ‘pump up’\)), where the acategorial status is required to generate the target state participles since the relevant stativizer only applies to acategorial roots. Thus these roots are akin to our result root denotations. However, she also posits another class of adjective/verb paradigms that do not form such participles, which she proposes are formed from lexicalized adjectives (e.g. \(\text{leer(en)} ‘empty Adj/V\)) with subsequent possible verbalization, which will not form target state participles since there is no acategorial root (pp. 393–4). In this sense there is a lack of decompositional structure to accomplishments based on these, which she says yields an inability for the latter class to take sublexical modifiers like \(\text{für} ‘for’\) PPs modifying the underlying state.

However, Kratzer does not make any claims about whether any of these adjectives have event entailments or not, and thus it does not correlate semantically with our PC roots. Furthermore, in English both PC and result roots can show the same sublexical modification facts as with \(\text{for an hour (e.g. PC root John emptied the basin for an hour and result root John dropped his head for five minutes), though factors like reversibility of the state may matter for acceptability as per §1.3.2), meaning there is no formal distinction between them of the sort Kratzer claims separates her \(\text{auf-pumpen}\) and \(\text{leeren}\) classes. For this reason our own analysis treats PC and result roots as formally identical in semantic type and category (both being acategorial roots denoting functions over individuals and states, though acategorialness is, as noted in §1.3, not an important feature of our analysis), differing only in entailments.
out by the data already discussed in §2.2, can be seen in the simple derivations in (40) for adjectives like those based on the PC root √flat in (40b) and the result root √crack in (40c), assuming the denotation for the adjectivalizing functional head is an identity function in (40a):

(40)  

(a) \([[\text{Asp }]] = \lambda P[P] \quad (=§1.6.1.3, (49a))

(b) \([[\text{Asp } \sqrt{\text{flat }} ]]] = \lambda x \lambda s[\text{flat}'(x, s)]

(c) \([[\text{Asp } \sqrt{\text{crack }} ]]] = \lambda x \lambda s[\text{cracked}'(x, s) \land \exists e'[\text{become}'(s, e')]]

The derivation in (40c), then, shows that we can generate the right meaning for result roots in basic adjectival contexts if we simply dispense with Bifurcation and admit that there is an entailment of change in the root.

A second prediction of this analysis concerns the nature of the change in result roots. If it is really a lexical property of some roots that they have an entailment of change, then we might expect the nature of that change to differ across roots, with some roots selecting for one kind of change, and other roots selecting for another. Precisely this state of affairs is reflected by the typology laid out in (30) and by the data showing that while some result roots, e.g. the break ones, are underspecified for the nature of the change they lexically entail and thus allow both temporal and atemporal changes, others, like the cooking verbs, can only describe temporal change. This contrast can be captured by assuming that the nature of the change that is lexically entailed by a root like √crack is underspecified for whether the causing eventuality is a state or an event as in (37b), while the change in cooking roots is lexically restricted to be temporal by virtue of constraining any eventuality giving rise to the change to be an event as opposed to a state, i.e. any such causing event e" is in the set of events $U_E$ as opposed to the set of states $U_S$:

(41) $$[[\sqrt{\text{cook }} ]] = \lambda x \lambda s[\text{cooked}'(x, s) \land \exists e'[\text{become}'(s, e')] \land \forall e''[\text{become}'(s, e'') \rightarrow e'' \in U_E]]$$

A third prediction concerns the scope of modification with adverbial modifiers like again discussed in §1.3.2. Recapping, with change-of-state verbs like open there are two distinct readings that again can have (Dowty 1979: 252): the restitutive reading wherein only the state had occurred previously but not necessarily a change into that state, and the repetitive reading wherein the (caused) change of state had occurred before, something that supposedly follows from a scopal ambiguity of sentence final again as in (42):\(^{19}\)

\[^{19}\]For illustrative purposes we assume repetitive modification is attachment to the highest vP, but any attachment site above the root will generate a repetitive reading of some sort, with different attachment sites differing in what else beyond the state occurred previously (as per §1.3.2).
Kim opened the door again.

(a) \[ [\text{vP}\ Kim [\text{v}\text{cause}\ [\text{vP}\ the\ door\ [\text{v}\text{become}\ \sqrt{\text{open}\ \text{again}}]\]]]]

(b) \[ [\text{vP}\ Kim [\text{v}\text{cause}\ [\text{vP}\ the\ door\ [\text{v}\text{become}\ \sqrt{\text{open}}]\]]\text{again}]\]

Assuming that all \(\sqrt{\text{open}}\) entails is that the theme is in an open state and not necessarily that it came to be in an open state—in other words that \(\sqrt{\text{open}}\) is a PC root with denotation (43a)—and that \text{again} has the denotation in (43b), then composing (43b) with (43a) produces (43c) a relation between open states and individuals \(z\) where there had been a prior open state for \(z\):

\[
(43)\quad \text{a. } [\sqrt{\text{open}}] := \lambda x\lambda s \{\text{open}'(x, s)\}
\]

\[
\text{b. } [\text{again}] = \lambda P\lambda z\lambda e''[P(z, e'') \land \exists e'''[e'' \ll e''' \land P(z, e'')]]
\]

\[
(= (26) \text{ in } \S1.3.2)
\]

\[
\text{c. } [\sqrt{\text{open}\ \text{again}}] := \lambda z\lambda e'''[\text{open}'(z, e''') \land \exists e'''[e''' \ll e'''' \land \text{open}'(z, e'')]]
\]

Conversely, if result roots such as the one in \text{melt} have an entailment of change as part of their meaning then even on low restitutive attachment as in (44a) (parallel to (42b)) there should still be an entailment of change under the scope of \text{again} and thus the reading will be repetitive:

(a) \[ [\text{vP}\ Kim [\text{v}\text{cause}\ [\text{vP}\ the\ ice\ cream\ [\text{v}\text{become}\ \sqrt{\text{melt}\ \text{again}}]\]]]]

(b) \[ [\text{vP}\ Kim [\text{v}\text{cause}\ [\text{vP}\ the\ ice\ cream\ [\text{v}\text{become}\ \sqrt{\text{melt}}]\]]\text{again}]\]

More precisely, if the root of \text{melt} has the denotation in (45a) then the restitutive scope reading of \text{again} will produce the meaning in (45b) by which not only does the melted state obtain again but the change into it does as well:

(a) \[ [\sqrt{\text{melt}}] = \lambda x\lambda s\lambda e''\{\text{melted}'(x, s) \land \exists e'[\text{become}'(s, e')]\} \]

(b) \[ [\sqrt{\text{melt}\ \text{again}}] := \lambda z\lambda e'''[\text{melted}'(z, e''') \land \exists e'''[e''' \ll e'''' \land \text{melted}'(z, e'') \land \exists e'[\text{become}'(e'', e')]]] \]

Furthermore, since all higher attachments (e.g. as in (44b)) will likewise scope over an entailment of change (introduced both by the root and also the \text{become} head), the prediction is that result roots will never admit truly restitutive readings in the truth conditional sense. Precisely this state of affairs has been observed by Rappaport Hovav (2010: 7), who shows that while sentences like (46) with PC roots can be true even if there has been only one change into the relevant state as in the given contexts, with result roots as in (47) the only reading is that there were two events of the relevant state coming about. Thus in contexts in which the
only possible reading would be a purely restitutive one such predicates should be unacceptable under again modification.\textsuperscript{20}

(46)  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)

c. [ Kim takes a photo that is too large to use as a Facebook profile photo. She shrinks it to a more appropriate size, but thinks it does not look good. So she restores it to its original size and puts it on her personal website instead. ]
Kim enlarged the photograph again. (could be just one enlarging)

(47)  a. [ A boutique store makes their shirts in the back. Sandy buys one and leaves with it, but then decides she does not want it. She goes back to the store with the shirt and exchanges it. ]
#Sandy returned the shirt again. (necessarily two returnings)

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

c. [ An ice cream factory manufactures ice cream from a package of ingredients by adding water and then freezing the result. After adding the contents of the package to water and freezing it, Kim lets it melt into a liquid state. ]
#Kim melted the ice cream again. (necessarily two defrostings)

None of the result roots allow a restitutive reading even in contexts that should support one.\textsuperscript{21} Indeed, as discussed in §2.2.1 in many cases with such roots it is

\textsuperscript{20} In Chapter 4 we make similar observations about manner of killing verbs in that there is no reading with modifiers like again that does not also entail some prior manner by which the change came about, suggesting that these roots violate Bifurcation in a different way, in entailing not only change, but also a cause bringing it about by virtue of a certain sort of action.

\textsuperscript{21} These judgments may be subject again to some speaker variation. Although the majority of people we have asked, including ourselves, find examples like (47) all unacceptable, one reviewer remarks that
hard to say what the prior state would be absent a change into that state (a fact which we believe is prima facie evidence for our claim in §5.2 that in many cases these states simply do not exist). It is hard to know, for example, exactly what the underlying state of most cooking verbs is without reference to the process. But if we assume the output of fry for example is being warm with brown, fatty edges, then a food item that grows naturally in such a state and comes to lose those properties still does not permit a restitutive reading with again:

(48) [ John is hiking in a very hot region and comes across a fruit that has brown, fatty edges. He picks it and takes it back to his house where he trims off the edges and puts it in the fridge. He later takes it out and fries it. ]

#John fried the fruit again. (necessarily two fryings)

The lack of restitutive readings with again thus supports the analysis proposed here which simply has it that a root can have an entailment of change as part of its truth conditional content, contra Bifurcation.

This observation is reinforced by similar observations tied to re– prefixation, and the readings of change-of-state verbs under it. Unlike again, which has been argued to show a genuine syntactically driven attachment ambiguity with high attachment giving rise to the repetitive reading and low attachment giving rise to the restitutive reading, re– has been argued to only attach low (Dowty 1979: 256; Wechsler 1989; Marantz 2007, 2009). The reason for this is that unlike again, which in some positions such as sentence initial and preverbal positions, generates only repetitive readings for all types of verbs, including even PC root change-of-state verbs, re– supposedly always allows restitutive readings in addition to repetitive readings:

(49) a. Again, John opened the door. (repetitive only)
b. John again opened the door. (repetitive only)
c. John reopened the door. (restitutive or repetitive)

while (47a) is indeed unacceptable, she finds (47b) and (47c) acceptable. This may reflect differences in lexicalization across speakers as per §2.2.3. Finally, a reviewer suggests that he finds (47a) and (47b) unacceptable even in repetitive contexts. We disagree, and note that naturally occurring examples can be found:

(i) a. I ordered a pair of shoes in early December... I tried them on and within minutes knew they were the wrong size, so I immediately got online and printed a return shipping label. I ordered the bigger size, which arrived 2 days later, and the next day I took the return package to UPS (Staples) to send the first pair of shoes back... Fast forward a couple weeks, and now I am returning the bigger pair of shoes to Amazon... I hate to have to return the shoes again. <http://storiesbystephen.com/2017/12/29/christmas-returns-amazon-vs-foot-locker/> (Accessed June 24 2019)
b. [In response to the question "Why exactly can't you refrost food that has been thawed?"] When you thaw the meat again the second time... <https://qc.answers.yahoo.com/question/index?qid=20090123002217AAFT7YC> (Accessed June 24 2019)
The categorical low scoping analysis of re– predicts this universal ambiguity between restitutive and repetitive readings by assuming that technically the restitutive reading is the only possible reading, and that any repetitive reading arises from the restitutive reading in pragmatic contexts where repetition has occurred in addition to restitution (since repetition asymmetrically entails restitution). However, crucially, with re–, just as with again, we see a contrast in readings with PC verbs having genuine restitutive readings and result verbs having only the repetitive reading, in particular by the fact that while the repetitive reading can be denied with PC verbs prefixed by re–, as in (50), it cannot with result verbs prefixed by re–, as shown by (51), even in plausible contexts:

(50)  

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 resharpened the knife. (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 relengthened the film. (could be just one lengthening)

c. [ Kim takes a photo that is too large to use as a Facebook profile photo. She shrinks it to a more appropriate size, but thinks it does not look good. So she restores it to its original size and puts it on her personal website instead. ]  
Kim reenlarged the photograph. (could be just one enlarging)

(51)  

a. [ A boutique store makes their shirts in the back. Sandy buys one and leaves with it, but then decides she does not want it. She goes back to the store with the shirt and exchanges it. ]  
#Sandy rereturned the shirt. (necessarily two returnings)

b. [ Leah kills a rabbit, takes it home and skins and butchers it and then puts the fresh meat in the freezer for three days. She then takes it out and puts it on the table to thaw. ]  
#Leah rethawed the meat. (necessarily two defrostings)

c. [ An ice cream factory manufactures ice cream from a package of ingredients by adding water and then freezing the result. After adding the contents of the package to water and freezing it, Kim lets it melt into a liquid state. ]  
#Kim remelted the ice cream. (necessarily two defrostings)
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d.  [ John is hiking in a very hot region and comes across a fruit that has brown, fatty edges. He picks it and takes it back to his house where he trims off the edges and puts it in the fridge. He later takes it out and fries it. ]
#John refried the fruit. (necessarily two fryings)

Assuming a uniform syntactic decomposition for the two classes of verbs, as we have in this section, and furthermore that re– is only low-attaching, as commonly assumed in the literature, these facts can only be made sense of if the roots of result verbs come with an entailment of change, by contrast with the roots of PC verbs. In this way, even on a low attachment the entailment of change is preserved since re– has scope over the full meaning of the root and result roots entail change. In short, syntactic decomposition can nicely account for the semantic contrasts, capturing facts about sublexical modification along the way, provided that Bifurcation is dispensed with and that we allow for a contrast in the lexical semantics of the two root classes.

A potential objection to this line of argumentation, however, comes from the reversative analysis of again in Deo et al. (2013), Pedersen (2014), and Beck and Gergel (2015). Roughly following the version of this analysis sketched in Deo et al. (2013: 111–2) again always modifies a verbal structure (i.e. never a root), and the semantics is that there is a reversal of a prior change. The restitutive reading is where the prior change is from being in a state described by the root to not being in such a state, while the repetitive reading is where the prior state was in turn the result of a change. On such an analysis, crucially, there is no scopal ambiguity, and in particular again never scopes over the root directly, meaning it is not technically a probe purely for root semantics divorced from the rest of the event structure. Nonetheless, it is not clear how this analysis would explain the absence of a restitutive reading with result root verbs—if the verbal structure modified by again entails the existence of some simple state divorced from a change then it should be possible to say that the one time change into that state is being reversed.

Assuming the worst, however, and supposing that the lack of root attachment somehow compromises the conclusions drawn from the again data or the re– data, the point still holds once we shift to other classes of sublexical modifiers. In particular, Spathas (2017), in a study of Greek which also applies to English, shows that additive modifiers equivalent to English also and too show exactly the same point in a way that requires a scopal analysis. In particular, (52) (with focus intonation on the object) allows one reading where John performed the same action to another entity, and another reading where this is the first time John has performed this action but there is another entity that is in the described state, the former analogous to a repetitive reading and the latter a restitutive reading where the patient of the prior event/state is different:
2.4 ANALYTICAL OPTION 1: ABANDON BIFURCATION

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

As Spathas shows a reversative analysis will not work here, since there is no prior change to reverse. Instead, a scopal analysis is required. Crucially, as Spathas also shows, the PC vs. result root distinction found with *again* obtains with *also*, which he illustrates for Greek, but his English translations behave identically (Spathas 2017: 10, 16, (76) gives data for *petheno* 'die', *skotono* 'kill', *kurazome* 'get tired', *filakizo* 'imprison', *skuriazio* 'get rusty', *vutirono* 'butter', *skonizome* 'get dusty', *etizomaze* 'get ready', *stejno* 'dry', *adjazo* 'empty', *isiono* 'straighten', *orimazo* 'ripen' for PC roots and *spazo* 'break', *ftiahno* 'fix', *liono* 'melt', *ragizo* 'crack', *anatinazo* 'explode', *vrisko* 'find', *eksfanizome* 'disappear', *pnigo* 'drown' for result roots):

(53) 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 shirt
   ‘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.’

(based on Spathas 2017: 10–11, (43)–(44), (47)–(48))

Thus additional sublexical modifiers support the point that with result root verbs it is not possible to (semantically) assert just the prior existence of the state divorced from the change that led to it, even controlling for whether the relevant reading is derived scopally or not.

The approach to the morphological distinction between the two root classes is less obvious. Any analysis needs an explanation of the crosslinguistically robust fact that result roots are generally not found in basic state contexts, while PC roots typically are. As it stands, and as demonstrated in (40), the current analysis ensures that a PC root Merging directly with an adjectivalizing head gets the basic state meaning, while a result root gets a result state reading, correctly predicting that the two roots should differ in this way. The crosslinguistic work surveyed in §2.3.2, however, suggests that result roots rarely appear in these basic state contexts in the first place, raising the question of whether such structures should be generated at
all, or if they are, how we can ensure that their morphophonological realization is systematically different to the realization of PC roots in the same contexts.

One way in which an analysis like the one sketched in this section could capture this contrast is with the assumption that purely stative meanings are unmarked as adjectives while roots with change in their meaning are marked as adjectives (in an iconic way reminiscent of Haspelmath 1993). If one strictly assumes that all lexical decomposition is syntactic, then this morphological contrast might be formally understood as root-conditioned allomorphy of adjectivalizing and verbalizing heads—null if the root has the appropriate unmarked reading and marked otherwise (though this could be overridden by root-specific rules to account for any item by item lexical idiosyncrasy):22

(54) Default realization for Asp with complement X (root $\sqrt{R}$ or $vP$):
    a. If X does not entail change, then $-\emptyset$
       (PC roots derive unmarked adjectives)
    b. If X entails change, then $-en/ed$
       (result roots derive marked adjectives)

This yields a morphological component to the verbal typology discussed here that again arises from the root and not (solely) the templates the roots occur in. An alternative might have it that result roots lack spell outs when combined solely with adjectivalizing heads and thus must always combine with $v_{\text{become}}$ first, which in turn generates the appropriate morphology, making all adjectives with result roots literally deverbal.23 It does bear mentioning that analyses such as these are not consistent with some lines of thinking in DM which have it that Spell-Out and semantics are independent of one another (Marantz 1996). Alternatively, the spell out for each root could, of course, be lexically listed. But given the crosslinguistic generality of the semantic contrast the pattern simply cannot be a morphological accident, and thus reducing it to a list would give rise to a clearly inadequate analysis of the morphology.

2.4.2 A purely lexicalist analysis

The debate between non-lexicalist and lexicalist approaches to event structure is one we believe hinges on facts outside the realm of those considered here. Our simple observation in this book is that Bifurcation, independent of framework,

22 See also the conceptually similar markedness conventions tied to decomposition and realization as adjective or verb in Lakoff (1965: Appendices A, C) and Green (1974: 22) for some discussion of them.
23 See Pross (2019) for a related argument from the domain of German participial morphology. Something similar would need to be said about the morphological asymmetry in the change-of-state verbs themselves documented in Beavers et al. (2018). See that study for preliminary thoughts on the matter.
must be abandoned. In this section we consider what a lexicalist analysis of the facts discussed in this chapter might look like. As discussed in §1.3.1, where a lexicalist analysis breaks with its non-lexicalist alternatives is in having word formation take place before syntax, so that it is fully formed words entering the syntactic derivation, though these words are nonetheless associated with event structures built from basic event-denoting primitives and lexical semantic roots analogous to the functional heads and idiosyncratic morphological roots of a syntactic event structural analysis.

The most straightforward lexicalist analysis that would capture the contrasts discussed above is to assume distinct categorial and semantic lexicalizations tied to the two lexical semantic root classes, with lexical derivations based on this initial lexicalization (cf. Koontz-Garboden and Levin 2005, Koontz-Garboden 2005, 2006).\textsuperscript{24} Quite what these distinct lexicalizations will be will vary depending on the nature of the language analyzed as well as the nature of the root. Starting with result roots in English, the most obvious analysis is that lexical semantic roots that fall into this class are generally lexicalized as change-of-state verbs rather than as adjectives, and any categories derived from this unmarked lexicalization will thus be deverbal. Whether the lexicalization of the change-of-state verbs is basically as a causative or as an inchoative would not bear on the matters discussed here. As noted in §2.2.1 there is crosslinguistic variation in which of the two verbal forms is the more basic one, though there are some root meaning-specific tendencies that figure into what the basic form is even internal to single languages (Haspelmath 1993: 104). Result verbs like \textit{break}, for example, are most commonly morphologically simple causatives in Haspelmath’s study, with the inchoative derived by some anticausative derivation. Thus for the sake of argument we could assume lexicalized event structures for result roots as caused change-of-state verbs similar in spirit to what was proposed in Dowty (1979: 200–5) where they are logical formulae with decompositional structure that sublexical modifiers could be sensitive to. We could thus assign \textit{crack} an event structure like that in (55), augmenting the Dowty-style representations with Davidsonian event variables (as e.g. in Rothstein 2004 and much other work) and assuming the lexical semantic root (treated here not as a morphological object, but we use the same √ root notation for expository purposes) would have the same truth conditional interpretation as √\textit{crack} in (37b):\textsuperscript{25}

\textsuperscript{24} A reviewer asks what is meant by lexicalization in this context. By it, we mean the pairing of a root with a template, an interpretation, and phonological form, with the pairing (the lexeme) assigned a lexical category, as in the foundational work on event structures discussed in §1.3.1, and ultimately going back to Dowty (1979).

\textsuperscript{25} Although we suggest lexicalization as causative with the inchoative derived for result roots, we consider this ultimately an empirical question, and not one that matters for the purposes of contrasting the various flavors of analysis discussed in this section, since a lexicalist analysis could equally assume lexicalization an an inchoative with the causative derived. What is crucial is not the direction of derivation between causative and inchoative, but rather the fact that with result roots the verb is not derived from a basic adjective.
If we assume that the truth conditions that define the operators such as CAUSE and BECOME are equivalent (with appropriate modifications) to those of the translations for the corresponding functional heads in syntactic event structures, semantically this analysis is equivalent to the syntactic one. And much in the way that we stipulated different types of change in the roots of crack verbs and cooking verbs above, we could do the same in the meanings of such verbs under this analysis in an identical fashion (e.g. the lexical semantic root of cook would impose a condition ensuring that \( e \) be in \( U_E \)). Assuming a compositional analysis of anticausativization as in Chierchia (2004a), Koontz-Garboden (2009a), Beavers and Koontz-Garboden (2013a,b), and Beavers and Zubair (2013) inchoative variants of lexically causative verbs would be derived from the causative and thus would inherit the meaning of the latter, as does indeed seem to be the case for result verbs in many familiar languages with overt morphological marking of anti-causativization. Morphologically, for result roots given the basic lexicalization as a verb with the denotation in (55), any stative form sharing the same root will have to be derived from the verb, as is transparently the case in languages like English.

By contrast, PC roots could be lexicalized as basic stative words (adjectives in English) with a denotation like that we have proposed for basic adjectives under the non-lexicalist analysis, having the truth conditions in (40b) because the root’s meaning has the same truth conditions as (37a) and there is otherwise no additional templatic semantics, meaning no change is introduced anywhere:

\[
(56) \quad [\text{flat}_A] = \lambda x \lambda s[\sqrt{\text{flat}(x, s)}]
\]

This makes several predictions. First, PC words are morphologically simple in their state-denoting form rather than morphologically complex (even if only covertly so) as in an analysis where such words are formed in the syntax from precategorial roots. Second, these words do not entail change since neither the template nor the root gives rise to such an entailment. Third, change-of-state verbs based on these roots will necessarily be morphologically complex since they must be derived from the morphologically basic and lexically-listed adjective, a prediction which Beavers et al. (2018) show to be correct across languages.⁶ Fourth, given a general

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²⁶ The generalization is slightly more complicated than this, given that there are many languages in which the basic state property concept term is not an adjective but rather a noun or a verb. Nonetheless, the key observation is that the simplest form tends to be the basic state one when there is a clear markedness asymmetry between the stative and change-of-state members of the paradigm, whatever category the basic state term happens to be, with change-of-state senses usually derivationally related (with the exception that change-of-state senses are sometimes coerced from states rather than derived in languages in which property concept words are verbs; Koontz-Garboden 2007, Matthewson et al. 2015).
2.4 Analytical Option 1: Abandon Bifurcation

In contrast to break roots. In particular, given the lexicalization of result roots as basic change-of-state verbs any adjectives formed from these will necessarily be deverbal, directly predicting the basic state gap. Finally, the derivational relationship between causative and inchoative for PC verbs is not predetermined by this analysis, and may differ to that of alternating verbs based on other states, as has previously been observed for at least some languages (Megerdoomian 2002, Alexiadou and Anagnostopoulou 2004, Koontz-Garboden 2006).

The core idea of this analysis, then, is that there is a contrast in lexicalization—basic state denoting adjectives in the case of PC roots vs. change-of-state-denoting verbs in the case of result roots—rather than in special Spell-Out rules. This derives the distinct morphological properties of the two paradigms of words rooted in the two different root classes as artifacts of the basic category plus subsequent derivation, though on both the lexicalist and syntactic analyses there is a core shared intuition that some kind of form-to-meaning markedness correlation obtains (in what is the unmarked lexical category for each root type on the lexicalist analysis vs. what root triggers zero-realized categorial heads in the syntactic analysis).

However, a set of facts that may distinguish between these two analyses are those involving sublexical modification. A purely lexicalist analysis along the lines articulated above is not without some complication with regard to restitutive modification in particular, which, as articulated by Dowty (1979: 264–9), requires positing an ambiguity in again between one use that triggers a repetitive reading fairly straightforwardly (by modifying the verb or verb phrase itself) and one that modifies the verb but ends up scoping over just the root by virtue of some meaning postulate operating over lexicalized event structures. A theory like this can capture the facts, including the contrast in availability of restitutive modification, given that the restitutive again would still on this analysis scope over a lexical semantic root whose denotation includes change in the case of result roots but lacks change in the case of PC roots.27

Nonetheless, such a treatment is deemed ad hoc by some (see e.g. von Stechow 1996: 130–2), though to some degree this is a matter of theoretical taste given that a syntactic decompositional analysis of verb meaning has properties of its own that

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27 This analysis does assume that the meaning of again is not as in Jäger and Blutner (2003: 404, (26)), where restitutive again applies to the verb and through some purely truth-conditionally defined semantic operator somehow pulls out a result state. We assume its meaning is instead dependent on the event structure, so that the entire meaning of the root, whatever it may be, is under the scope of again. This is tied to the fact that a purely lexicalist analysis does not obviate the need for a root/template distinction and event structure more generally, which is required not just for accurate characterization of sublexical modification facts discussed immediately above, but other facts discussed in §1.4.3, e.g. that roots act as scopal units and that templates determine various asymmetric prominence facts about arguments whether it is conceived of lexically or as part of the syntax. See also §2.6, §3.10, and §4.7 for further discussion.
are arguably ad hoc (e.g. the need to posit functional heads for which there may be little to no independent evidence; see also §1.3.1, fn. 4). Another problem raised by von Stechow (1996: 131) is that such an analysis, at least as articulated by Dowty (1979), does not capture the syntactic restrictions on the restitutive/repetitive readings of again (or its German counterpart) regarding position of the again modifier, where preverbal or presentential again lacks a restitutive reading altogether. Further, Bale (2007: 461–3) points out that additional intersective adverbial modification on the restored state makes the meaning postulate analysis difficult because it precludes access to the event structure in the way proposed by Dowty. Our goal here is not to solve these kinds of problems, but rather to highlight the merits and problems with different kinds of analysis consistent with the facts we have discussed in this chapter. This particular problem is not a problem with an analysis that gets rid of Bifurcation, but rather a problem in dealing with the facts of restitutive modification in a lexicalist analysis more generally.

2.4.3 A mixed analysis

Another style of analysis would mix aspects of the lexicalist and non-lexicalist analyses above, with word formation largely syntactic but the syntactic terminals always categorial. Thus while derivational processes find their locus in the syntax, the actual categorization of words does not (see §1.3.2). Although there are many ways of proceeding with these assumptions, on such a theory, PC roots would be lexicalized as adjectives and result roots as verbs, just as in the lexicalist analysis, but all subsequent word formation is syntactic, e.g. the derivation of PC adjectives into verbs happens in the syntax via functional heads and the result root verbs may (for example) be lexicalized as inchoative verbs and then derived into causatives syntactically as per Kratzer (1996).

For both kinds of roots, deverbal adjectives would be derived syntactically from the verbs. On such an approach, the variation across roots in terms of their morphological properties regarding the causative alternation—whether the inchoative or the causative is the unmarked member of the pair—might be treated as in Doron (2003), where the event structures are the same for all causatives and for all inchoatives but the spell out of the relevant functional heads differs depending on the root class. This analysis comes automatically

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28 Something like this seems possibly what Baker (2003: 269, fn. 2) has in mind, and might be a way of reading Hale and Keyser (2002).

29 This approach is not without problems, however, since it does not capture the causative entailments that even inchoatives seem to have in some languages noted in §2.2.1; see Koontz-Garboden (2009a), Beavers and Koontz-Garboden (2013a,b), and Lundquist et al. (2016) for further discussion. Also, the above is not to say that root class alone might be the sole determining factor of the morphophonological shape of the verb in Hebrew.
2.4 ANALYTICAL OPTION 1: ABANDON BIFURCATION

with a straightforward analysis of restitutive modification: restitutive vs. repetitive modification again arises as a syntactic attachment ambiguity, where restitutive scope is over the underlying adjective of PC verbs and the inchoative core of result verbs—the smallest attachment point in each case—the former of which does not also have entailments of change but the latter does. Such a theory would straightforwardly capture the morphological contrasts by, much as in the lexicalist analysis, setting up two grammatical categories of root. Also, like the non-lexicalist analysis, it provides a straightforward explanation of the facts tied to restitutive modification.

2.4.4 Summary

The three analyses sketched here—one accepting purely syntactic categorization and word formation, one placing all categorization and word formation in the lexicon, and one mixing those two approaches—share in common a single key assumption that handles the basic facts, namely that the roots of PC and result verbs differ systematically in that the latter lexically entail change and the former do not. Ultimately, independent of the theoretical particulars, it is this analytical contrast which we believe the facts discussed in this chapter point toward, but which is fundamentally inconsistent with Bifurcation. The specific details of each theory (which were just sketched above) represent the kinds of trade-offs different sets of assumptions make in capturing the morphological and sublexical modification facts, though in each case something—a theory of lexicalization of word categories based on the type of the (lexical semantic) root or a theory of Spell-Out of categorizing morphology—must be assumed to capture the basic correlation that (lexical semantic) roots lacking entailments of change form unmarked adjectives and those bearing them form unmarked verbs.

Cutting across the implementational details, though, the sublexical modification facts always hinge on having a single lowest scopal point entailing both a state and a change simultaneously. Furthermore, the morphological markedness correlations should ultimately not be too surprising: since change is itself already a semantic category that has grammatical consequences—being for example the basis of _become_ and its equivalents in other theories—then if processes in a language are already sensitive to this type of meaning it is unsurprising that they might treat roots entailing this meaning differently from roots that do not, however this is implemented. In sum, the root carries an entailment that can be elsewhere introduced templatically, and it can matter grammatically. But this is all, as noted, inconsistent with Bifurcation. For this reason, we next consider analyses that do not reject Bifurcation to see how (and how well) they account for the same sets of facts.
2.5 Analytical option 2: Preserving Bifurcation

While we believe that the facts discussed in this chapter argue strongly against Bifurcation, maintaining it is still technically possible. In this section we critically outline some of the ways in which a theory could still maintain it while capturing the facts discussed in this chapter, at least to some degree. The key fact is that in all of them some other distinction between PC and result roots must be posited to explain their distinct behavior other than the meanings of the roots. However, as we show the different types of distinctions and the theories that derive the relevant facts from those distinctions are often lacking either empirically or theoretically.

2.5.1 Reanalyzing result roots as manner entailing

Embick (2009) considers an analysis of the facts discussed above that would preserve Bifurcation, assuming result roots have a fundamentally different syntactic and semantic status than they do on a more traditional analysis. In particular, rather than being state-denoting and having the syntax expected of a state-denoting root as in (57a) for PC roots, result roots have a manner meaning and merge in the position of manner modifiers, i.e. as adjuncts of some \( v \) as in (57b) (Embick 2009: 6, 17). (In both cases Embick has the patient as a complement to the stative head rather than as a specifier of a \( v \) as we have had it above; this distinction is irrelevant for present purposes.)

\[
\begin{align*}
\text{a. PC roots} & \quad \text{b. result roots} \\
\vP & \\
\v & \vP \\
\sqrt{\text{RED}} & \sqrt{\text{BREAK}} \\
\text{DP} & \text{DP} \\
\end{align*}
\]

The idea embodied by (57) is that \( \sqrt{\text{BREAK}} \) denotes a predicate of events (composing with \( v \) by predicate modification) and takes an unspecified state (ST) as an argument. In this way, it has a denotation on a par with the roots of manner verbs like \textit{pound} which imposes entailments on the agent of a pounding, but says nothing about the resulting state of such an event.

Embick’s proposal is made absent a theory of what exactly manner is semantically. However, in §4.3 we review diagnostics for manner based on Rappaport Hovav (2008) and Rappaport Hovav and Levin’s (2010) idea that manner is non-scalar. Part of this will involve showing that \textit{break} in particular—and also other so-called canonical “result verbs” that are based on result roots—entail a result but crucially no manner. For this reason we defer a full accounting of the fact that
break and its ilk do not entail a manner until then. Instead we just presage that discussion by making a couple of observations.

First, verbs that impose manner-oriented lexical entailments on one of their arguments lexically specify the nature of an action of some sort, generally making it possible for only certain types of entities to perform the actions described by the verb, thus restricting the possible subject DPs the verb can take (see §1.6.2.1). Thus canonical manner verbs like scrub or wipe only permit subjects that can be said to be able to perform scrubbing or wiping actions respectively, precluding inanimates (except when interpreted as instruments manipulated by an unexpressed agent; see §1.1, fn. 2) and natural forces:

(58)  
  a. John scrubbed/wiped the floor with a stiff brush.  
  b. ??The stiff brush scrubbed/wiped the floor.  
  c. ??The earthquake scrubbed/wiped the floor.  
  d. ??The pressure from the water scrubbed/wiped the submerged floor.

Verbs like break or shatter on the other hand are well-known to allow a range of subjects (see e.g. Levin and Rappaport Hovav 1995: 85; 102–6), something that is not incompatible with entailing a manner of some sort for the subject but certainly does not offer any support for that conclusion.\footnote{One might conclude that the fact that lack of thematic restriction on the subject of a transitive change-of-state verb strongly correlates with participation in the causative alternation (Levin and Rappaport Hovav 1995: 85 and Reinhart 1996: 17 and also §2.2.1) that this alternation is actually a diagnostic of a lack of manner entailments on the subject of the causative. However, such a conclusion is too strong, for two reasons. First, it presupposes an underlying analysis of the causative alternation from which it actually follows that absence of manner should correlate with alternating. Although this is arguably the case for the reflexivization analysis (Chierchia 2004b, Koontz-Garboden 2009a), it is likely not for other analyses (see Koontz-Garboden 2009a: 123–34 for discussion), and the reflexivization analysis remains controversial (see Koontz-Garboden 2009a, Horvath and Siloni 2011, 2013, Beavers and Koontz-Garboden 2013a,b and Lundquist et al. 2016 for extensive back and forth on the issue). Second, more generally, there is reason to tread carefully because use of the alternation as diagnostic of manner presupposes a more thorough understanding of what manner is than is currently available. As we discuss in §4.3, although it is possible to identify particular classes of entailments that cannot be understood as anything other than manner, the state of the art is not yet such that it is possible to understand manner generally. The possibility therefore remains that even those verbs with thematically underspecified external arguments could have manner entailments imposed on them for which we do not yet have tools to diagnose. As discussed in §4.3, it is preferable to use positive diagnostics for particular kinds of manners, rather than negative diagnostics for lack of manner altogether, which is the kind of diagnostic that the causative alternation would be.}

(59)  
  a. John broke/shattered the vase with a hammer.  
  b. The hammer broke/shattered the vase.  
  c. The earthquake broke/shattered the vase.  
  d. The pressure from the water broke/shattered the windows of the submerged car.
This goes hand in hand with the fact that with human subjects, which are acceptable with both a canonical manner-entailing verb like *scrub* and also with a verb like *break*, it is difficult to deny that the subject performed any action at all in the former case but easier in the latter case:

(60)  

a. #Jim scrubbed/wiped the table, but he didn't move a muscle.

b. Kim broke/shattered my DVD player, but she didn't move a muscle—instead, despite being in charge of taking care of it, she just negligently let the rotor run until it spun out of control and damaged the whole thing.

Now, it could be that the manners associated with *break* or *shatter* are not of the sort that involve physical motion of the body per se despite the fact that these two verbs describe changes-of-state that are real world, physical changes. If there is manner there, however, it is unclear what it would be in the case of these two verbs. Absent a more specific claim, the more likely assumption is that there is no manner in the meanings of these two verbs at all, consistent with the orthodox view on the meanings of such verbs. In sum, we do not believe that there is any evidence for the claim that result roots are manner entailing. (See Chapter 4 for further discussion.)

2.5.2 Allosemy

The fundamental problem faced by any analysis that preserves Bifurcation is that the roots of result verbs fail to generate the expected inferences in the expected contexts if they were indeed purely stative. This, in turn, seems to be reflected in the morphology. But leaving that problem aside, another key question is how to capture the fact that the roots of result verbs give rise to an inference of state change in contexts where they are not expected to. There are two principal contexts of concern: basic state constructions and restitutive modification as with *again* and *re-*. In this section we consider an allosemic analysis of parts of the structure of change-of-state verbs and adjectival derivatives in the spirit of Myler (2014) and Wood and Marantz (2015) which would correctly capture the facts. We argue, however, that such an analysis does so at a theoretical cost in that it requires positing denotations for functional heads that appear in just the places they are needed to make the analysis work and nowhere else and which are not independently motivated by any facts outside this particular domain.

We consider first the adjectival structures. As discussed in §2.2.1 a core problem for Bifurcation is that just as PC roots appear in basic adjective structures like (61a) we also expect result roots to as well as in (61b):
The question then is how to ensure that by contrast with (61a), (61b) gives rise to the (templatic) entailment of change that \textit{cracked} and its result-root ilk are known to give rise to without locating that entailment in the root itself. A possible answer comes from an allosemy analysis whereby functional heads can vary in their meaning depending on the syntactic context in which they appear. Suppose, then, that there are actually two different interpretations for Asp, as in (62):

\begin{enumerate}
\item \([\text{Asp}] = \lambda P P\)
\item \([\text{Asp}] = \lambda P \lambda x \lambda s [P(x, s) \land \exists e'[\text{become}'(s, e')]]\)
\end{enumerate}

If we assume root meanings for both \(\sqrt{\text{flat}}\) and \(\sqrt{\text{crack}}\) as in (63) with no templatic meaning (i.e. \textit{cracked'} is interpreted with no lexical entailment of change), consistent with Bifurcation, the allosemic idea would be that in (61a) Asp is interpreted as in (62a) while in (61b) it is interpreted as in (62b):

\begin{enumerate}
\item \([\sqrt{\text{flat}}] = \lambda x \lambda s [\text{flat}'(x, s)]\)
\item \([\sqrt{\text{crack}}] = \lambda x \lambda s [\text{cracked}'(x, s)]\)
\end{enumerate}

The driving force behind the difference in interpretation would be the specific root Asp Merges with—it is interpreted one way with some roots and another way with others, so that in particular in (63a) we only ever get Asp interpreted as (62a) while with (63b) we only ever get Asp interpreted as (62b). Compositionally, this leads to different interpretations for the adjectival structures rooted in \textit{flat} and \textit{crack} respectively as in (64), with a basic state interpretation for the former and a result state interpretation for the latter:

\begin{enumerate}
\item \([\text{Asp} \sqrt{\text{flat}}] = \lambda x \lambda s [\text{flat}'(x, s)]\)
\item \([\text{Asp} \sqrt{\text{crack}}] = \lambda x \lambda s [\text{cracked}'(x, s) \land \exists e'[\text{become}'(s, e')]]\)
\end{enumerate}

The situation will be similar for \(v_{\text{become}}\) on an analysis of this sort; as discussed above in relation to the typology (30), different roots select for different varieties of change, with some, like the cooking roots, only allowing for temporal change, and others, like \textit{break} roots, allowing for both temporal and atemporal change. Given
that pinning this difference on the relevant roots is not a possibility if one assumes Bifurcation, there will have to be at least a temporal alloseme of \( \text{v}_{\text{become}} \) alongside either an atemporal or an underspecified one. A similar additional polysemy for Asp will also be required, since the same roots presumably only allow temporal change in adjectival forms as well. Which alloseme appears with which root will then be determined root-specifically, in a manner much like how the interpretation of Asp in (64) depends on which root it appears with.

While this analysis gets the basic semantic facts right, it still does not immediately capture the restitutive modification facts with \( \text{again} \) and \( \text{re-} \), since these are assumed to attach to the root on restitutive readings and the root in both cases will be a basic state, thus failing to generate the contrasting readings with PC roots versus result roots. A simple fix would be to posit that, contrary to assumptions in the decompositional literature as embodied in structures for change-of-state verbs like those in (31c) and (31d), repeated in (65a,b), where inchoatives and causatives are built directly from roots, inchoatives and causatives are instead genuinely deadjectival, so that \( \text{v}_{\text{become}} \) takes as its complement an AspP, as in (66a,b):

(65) a. Inchoatives under the standard theory (Embick 2004: 365)
\[
vP \\
  \downarrow \quad \downarrow \\
  DP \quad v' \\
  \downarrow \\
  v_{\text{become}} \quad \sqrt{\text{ROOT}}
\]

b. Causatives under the standard theory (Embick 2004: 366)
\[
vP \\
  \downarrow \quad \downarrow \\
  DP \quad v' \\
  \downarrow \\
  v_{\text{cause}} \quad vP \\
  \downarrow \\
  DP \quad v' \\
  \downarrow \\
  v_{\text{become}} \quad \sqrt{\text{ROOT}}
\]

(66) a. Inchoatives under the deadjectival theory
\[
vP \\
  \downarrow \quad \downarrow \\
  DP \quad v' \\
  \downarrow \\
  v_{\text{become}} \quad \text{AspP} \\
  \downarrow \\
  \text{Asp} \quad \sqrt{\text{ROOT}}
\]
b. Causatives under the deadjectival theory

If we furthermore assume that *again* cannot scope directly over roots but instead over AspPs, then the contrast in restitutive modification can be captured, since Asp in the context of a PC root is interpreted as (62a) while in the context of a result root it is interpreted as (62b), thereby ensuring that no real restitutive reading is available with result roots even under low attachment.

While this constellation of assumptions does save Bifurcation, it raises some questions. First, it relies on novel and as yet unmotivated theories of (i) the syntax of change-of-state verb formation and (ii) the syntax of restitutive modification (again, given the received view discussed above that restitutive re- attaches to the root). Second, it remains unclear on this theory why, as discussed in §2.3.2, PC roots have basic state forms (basic adjectives in English) that result roots overwhelmingly lack across languages. If result roots really do appear in the same basic state structure as PC roots, why do we not see more morphosyntactic evidence of it? Finally, a more high-level consideration is the question of where precisely the right place is to put idiosyncrasy in the grammar. The allosemic theory ultimately puts it in the syntax, making the difference in meaning between the two classes of adjectives a consequence of the combination of elements in context. It may be a matter of theoretical taste where such idiosyncrasy is best placed. Our intuition is that building this contrast into the meanings of the roots themselves gives rise to a theory with a range of additional desirable properties. This is largely because, as we have suggested briefly in §2.4.1 and discuss more in §5.2, the entailment of change might be best thought of as arising from the nature of the state itself and presumably the same kinds of states have the same kinds of properties across languages. In other words, the intuition we outlined above is that result roots are those that describe states that are conceived of independently as arising from some change, while PC roots describe those that do not require this. Thus the entailment of change is a part of the meaning of the former and not the latter owing to non-linguistic conceptual properties of different sorts of states.
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Yet this is not a property of the roots on the allosemic theory. Rather, it is an idiosyncratic property of the functional head in combination with particular roots, which must be listed on this theory. By assuming Bifurcation, roots cannot differ in meaning in the appropriate way, raising the question of why the same kinds of states across languages generally only appear with one interpretation of the functional head, while other states only appear with the other. If it is assumed to actually be based on the meanings of the roots, then the question becomes why we would need allosemy anyway since the root already has the relevant component of meaning built into it and the facts would thus follow without the allosemy theory. So the allosemic analysis has stipulations in it that, once resolved, obviate the need for allosemy. There may, of course, be other reasons for why a theory of allosemy in the context of DM is necessary (as discussed by Myler 2014 and Wood and Marantz 2015). We remain agnostic on that question and are simply suggesting that saving Bifurcation by appealing to such a theory is unwarranted.

2.5.3 Root selection for syntactic construction

Another conceivable analysis that would maintain Bifurcation, in the spirit of Alexiadou et al. (2006: 202, (51)) and Ramchand (2008: 12–5, 57–62), would be one in which roots can select for the functional context in which they appear through some kind of featural mechanism (or by some classification defined by intuitionistic semantic groupings of roots that are not technically truth conditional in nature). For example, we might say that all result roots come with a feature, call it \([+v_{\text{become}}]\), that requires them to Merge with a \(v_{\text{become}}\) head. In this way, result roots would be prevented from appearing in the basic state context, since immediate Merge with Asp would fail to satisfy the \([+v_{\text{become}}]\) feature on the result root. PC roots, by contrast, would lack such a feature, so could Merge freely with Asp or \(v_{\text{become}}\). Most likely a theory such as this would need to also posit atemporal and temporal flavors of \(v_{\text{become}}\), alongside the associated selectional features, in order to capture the contrast noted above in (30) in what kinds of change result roots select for.

As with the allosemic analysis, if we adhere strictly to Bifurcation so that change-of-state verbs built on result roots have their entailments of change (of whatever kind) introduced only by \(v_{\text{become}}\) and not by the root at all, then the question arises of how to account for the observed contrasts in restitutive modification.

As noted in §1.3.3 this is similar in spirit to the analysis of Rappaport Hovav and Levin (1998: 108–9), wherein the lexicalized event structure associated with any lexical semantic root is determined by default associations of roots with particular event structures via canonical realization rules. On this analysis roots of break verbs for example are associated in the lexicon with caused change-of-state event structures.
Here, we would have to assume that with result root change-of-state verbs the syntax of again and re– attachment is different to its syntax with change-of-state verbs built on PC roots, with again and re– unable to attach below \( v_{\text{become}} \) with the former class of roots while they can with the latter. Such an analysis would then predict that there is no genuine restitutive reading with result verbs while there is with PC verbs. While researchers like von Stechow (1996: 109) and Beck and Johnson (2004: 120) have indeed argued that again (and its ilk) can have different syntax with different verbs, we are unclear what empirical arguments there might be to independently motivate this kind of contrast with again and re–, at least beyond the particular facts with again and re– that such an analysis is meant to explain.

More broadly, although such a theory offers the potential for capturing the contrast between result roots and PC roots in a way that maintains Bifurcation, it has drawbacks. First, it puts much of the idiosyncrasy in the syntax, and second, it relies on root-specific syntactic stipulations which mimic the lexical semantics rather than directly reflecting it. Again, given the crosslinguistic generality of the root class distinction, this kind of contrast will have to be replicated in the syntax of language after language—arguably the wrong place for such stipulation. However, if the locus of the stipulation is the actual semantics of different roots rooted in the kinds of states they describe, as we have suggested here and discuss further in §5.2, then it raises the question of why we would want the featural specifications anyway since the semantics already do the job without need to replicate it in the syntax (see Beavers and Zubair 2013: 39 for a related discussion of the redundancy of replicating an independently justified semantic analysis of agentivity in terms of syntactic features).

### 2.5.4 Summary

In this section we have considered various ways to preserve Bifurcation while still capturing the data discussed here. While such approaches are certainly possible, we believe that they come with certain complexities that approaches that reject Bifurcation do not. This includes either a wholesale rethinking of the classification of result roots as manner roots which lacks little independent justification, or essentially placing the bulk of the explanation on functional heads or featural systems that are contingent on formal properties of the relevant roots without positing any semantic distinctions between the roots, despite the fact that the distinctions are more plausibly based on root semantics itself, thus obviating the need for such additional theoretical complexities. The question would be what, other than Bifurcation, would motivate such analyses. Until such justification is given, analyses that reject Bifurcation are preferable.
2.6 Roots vs. templates in change-of-state verbs

At this point we return to an issue first raised in §1.4.3: if roots can have the meaning of \( v_{\text{become}} \) in them, is there any reason to posit that there is \( v_{\text{become}} \)? What value is there to maintaining the root vs. template distinction? Here we suggest that despite our conclusion about root meanings, there are clear reasons to continue to maintain this that echo the same issues we discussed in §1.4.3. First and foremost, of course, is that some stative roots do not entail change, yet take that reading on in certain contexts (e.g. as with descriptively deadjectival inchoative and causative verbs). Here something must be contributing the meaning, and the obvious candidate is the syntactic environment, i.e. a templatic head like \( v_{\text{become}} \).

Second, we had noted in §1.4.3 that roots act as complete scopal units such that for any state that one entails no matter how complex it is in terms of the number of truth conditionally distinct lexical entailments in it, they will all always be under the scope of sublexical modifiers like \( \text{again} \). This fact is reinforced and in fact demonstrated more dramatically with result roots in §2.4.1. With result roots not just the entire state but also the prior change of state itself is under the scope of \( \text{again} \) on a restitutive reading, but crucially with PC roots the state and the change can be separated. Thus even though a root can introduce a meaning that can also be introduced by a templatic head, only when they are introduced by templates can they be separated. Roots themselves do not provide the kind of structure to the semantic representation that allow for templatic meanings to be separated from the more idiosyncratic portion of the root meaning. This thus reinforces the key point in §2.4.1 that a root vs. template distinction is justified and motivated on more morphosyntactic grounds, if not necessarily on purely semantic grounds as Bifurcation might have.

2.7 Concluding remarks

The Bifurcation Thesis predicts a range of homogeneous morphological and semantic behavior in the domain of change-of-state verbs, which we have shown not to be borne out by the facts. There turn out to be at least two distinct classes of roots of change-of-state verb, so far as morphological and semantic behavior are concerned. Result roots introduce not only entailments about the nature of the state, but also an entailment of change itself. Such roots contrast with PC roots, which do lack change entailments (consistent with Bifurcation). This semantic contrast is reflected in the morphology, where we find that the former type of root is not attested in the same morphological forms as the latter, and the failure to find these roots in the same morphological environments is crosslinguistically systematic; it is not simply an accident of English, as has previously been claimed.
This classification of roots (incorporating also subclasses of result roots in terms of whether temporal change is required or not) produces a predictive verb class typology that derives solely from the roots of the relevant event structures and not (solely) from the templates themselves. We return to the question of root-based verbal typologies and their significance in theories of event structures in §5.4.

We then considered the theoretical consequences of these observations, exploring in a variety of theoretical backdrops what it would take to preserve Bifurcation in the face of the empirical evidence. Fundamentally, maintaining Bifurcation requires a considerable number of theoretical assumptions to get the facts right, suggesting that the facts point more clearly in the direction of falsifying Bifurcation, with result roots having an otherwise templatic entailment of change as part of their core. The question, then, is how to incorporate this observation into a theory of argument structure and the syntax/semantics interface. We explored a variety of options, all with their various advantages and disadvantages and all requiring at least some stipulations of their own to fully capture the data, though fewer than analyses that do not reject Bifurcation. Ultimately, our point here is not to decide among these, since we believe it is in part a matter of theoretical taste and independent assumptions whose justification lies beyond the scope of this book. What is clear, however, is that in whatever way the facts are to be accounted for, they falsify Bifurcation.

The deeper question here is why this would be the case, and as we have suggested briefly in §1.4.3 and §2.4.1 we believe it has to do with how we conceive of different kinds of states and whether a state can exist without a change or whether a change is part of the very definition of a given state. Before we return to this in §5.2, we turn to our next case study of templatic meaning being found in roots, namely templatic meaning found in the roots of ditransitive verbs of caused possession.