Deconstructing the Internal/External Causation Distinction

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1. THE DISTINCTION AND ITS MOTIVATION

Levin and Rappaport Hovav (1995; LRH) introduced a distinction between verbs which they called **EXTERNALLY CAUSED** and those which they called **INTERNALLY CAUSED**[1] (building on insights from Smith 1970), in order to account for the distribution of verbs in the causative alternation. As seen below when looking at intransitive verbs, one finds that some (those in 1-4) have transitive counterparts with a causative paraphrase, whereas others do not (those in 5-8). The former have been called externally caused and the latter internally caused, for reasons to be expounded below.

1. a. The vase broke.
   b. My kids broke the vase. (My kids caused the vase to break.)
2. a. The soup cooled.
   b. The chef cooled the soup. (The chef caused the soup to cool).
3. a. The road widened.
   b. The city widened the road.
4. a. The ball bounced.
   b. The players bounced the ball.

5. a. My kids played.
   b. *The camp director played my kids.
6. a. The trees blossomed.
   b. *The farmer blossomed the trees.
7. a. Trump trembled.
   b. *Putin trembled Trump.
8. a. The soldiers' wounds glowed in the dark.
   b. *The bacteria glowed the wounds in the dark.

Examples of verbs from the two classes, as they appear in LRH, are shown in (9) and (10).

9. **externally caused**:
   a. Change of state *break, cool, dry, lengthen, loosen, open, narrow, sink, smooth, whiten, widen*…
   b. Motion *bounce, rock, roll, spin…*
10. **internally caused**:
   a. Agentive *play, sing, smile, think…*
   b. Non-agentive Activity *blush, hesitate, quiver, shudder, tremble …*
   c. Change of state *corrode, deteriorate, erode, ferment, grow*[2]*, rust, sprout, wilt, wither…*

[1] LRH use the terms internally and externally caused *verbs*, though this is something of a misnomer since the verbs themselves are not caused. But this is the term that has been used in subsequent literature. Since I ultimately argue that there is no grammatically relevant distinction between the two classes of verbs, I won't make an attempt to improve the nomenclature.

[2] *grow* does not appear in the LRH's appendix listing internally caused COS verbs, but it does appear in Levin's class of entity-specific COS verbs, which are claimed in LRH to be internally caused. This verb

d. Emission *gleam, glitter, glow, twinkle…gush, ooze*…

The verbs in (9) are characterized externally caused and participate in the alternation; for each such verb it is possible to add a cause argument, as in (1- 4). In these examples, the cause is an agent (or an institution representing agents in (3b)), though we will see that causative alternation verbs in principle allow other types of causes. The verbs in (10) are characterized internally caused and are claimed not to participate in the alternation. The major classes of internally caused verbs on LRH's analysis include: agentive activity verbs, a rather small subset of change of state verbs, verbs of emission (e.g., light, sound and substance emission), and a variety of other (aspectually) activity verbs, like *tremble, shudder*, *slouch* and *hesitate*, which are typically predicated of humans but are not agentive. The two major classes of externally caused verbs are change of state (COS) verbs and non-agentive verbs of manner of motion[3].

Some kind of distinction regarding the nature of causation implied by the verb has subsequently been adopted, with important variations to be discussed in this paper, by many researchers: Marantz (1997); Harley and Noyer (2000); Alexiadou, Anagnostopoulou and Schäfer 2006; 2015); Alexiadou (2010), McKoon and Macfarland 2000) and Wright (2002), among others.

In this paper I question whether there is a grammatically relevant distinction between internally and external caused verbs. Anticipating the conclusion, I will argue that there is no such grammatically relevant distinction. The class of verbs listed as internally caused in (10) do not as a group share any significant grammatical properties, as I will show. Rather this list includes a heterogeneous class of verbs with respect to argument realization in general, and with respect to the causative alternation in particular. I will then focus on the class of verbs which have been termed internally caused change of state verbs (10b), since these have figured most prominently in discussions of the internal/external causation distinction. I will show that (i) there is no significant grammatical distinction between these verbs and the rest of the class of COS verbs and (ii) that some verbs which have been classified as internally caused COS verbs have been misclassified; they are not COS verbs at all. After setting the misclassified verbs aside, I show, building on previous research in Rappaport Hovav (2014) that the same principles which govern the causative alternation with what have been called externally caused COS verbs govern the alternation with what have been called internally caused COS verbs, thus attributing the phenomenon which motivated the distinction between internal and external causation to factors other than a grammatical classification of the verbs.

In order to assess the grammatical relevance of the external/external causation distinction and its connection to the phenomenon it is meant to account for – the participation of verbs in the causative alternation – I suggest that we evaluate analyses of the alternation which rely on the distinction according to their success in answering the following questions[4]:

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figures prominently in subsequent discussions of the causative alternation in DM, where the issue is the explanation for the lack of a causative counterpart for the verb.

[3] Verbs such *roll, bounce, spin* and *rock* can be agentive, of course, but need not be. They share properties with verbs classified as externally caused when the theme of motion is non-agentive. When they are used agentively, they show properties of agentive manner of motion verbs and these display different properties with respect to the causative alternation (see fn. 8).

[4] I do not provide a complete analysis of the causative alternation here. There is a very large literature on the topic. For overview see Schäfer (2009) and more recently Alexiadou, Anagnastopoulou and Schäfer (2015).

11. **QUESTIONS REGARDING THE INTERNAL/EXTERNAL CAUSATION DISTINCTION**

- What is it exactly that we are classifying? (verbs? roots? eventualities? event descriptions?)
- What is the semantic explication of the distinction? Are there ways to diagnose the semantic distinction independent of the causative alternation?
- How do we represent the distinction linguistically?
- Is there a natural connection between the explication, the representation and the data we want to account for?
- Is the distinction grounded in a viable theory of the linguistic representation of causation?

I will argue that there is no viable answer to the first question. That is, there is no coherent classification of roots, verbs, or event descriptions which rests on a distinction between internal and external causation. Attempts to classify verbs or roots according to these categories are consistently unsuccessful, as are attempts to encode the distinction structurally and to correlate the distinction with grammatical diagnostics other than patterns of participation in the causative alternation, which remains the only motivation for the distinction. In the final analysis, we can identify a class of roots/verbs which may appear in structures with and without an external argument interpreted as a cause – and thus participate in the causative alternation. The core of this class is the class of COS verbs, with no lexical distinction between internally and externally caused verbs. Our task is to articulate the principles which govern the (non)appearance of the cause/external argument. I will argue that the same set of principles is relevant for all roots/verb which alternate. What can be said about the verbs which have been termed internally caused COS verbs is that they describe changes, which, when predicated of a concrete entity, often describe changes which occur in the natural course of events with respect to the concrete entity. Changes which occur in the natural course of events are more often described without the cause mentioned, and when the cause is mentioned, it is typically of a restricted semantic type. But these properties fall out of the general principles which govern the (non)appearance of the external argument in causative alternation verbs. Moreover, these verbs do not always describe such changes, so that the properties are not grammatically encoded properties of verbs or roots.

This paper is organized as follows. In §2 I review how the analysis in LRH addressed the questions posed in (11). In §3 I review well-known empirical and conceptual problems for that analysis which have perforce led to a reconsideration of many aspects of that analysis. In §4 I review a recent analysis of the internal/external causation distinction laid out in Alexiadou (2014) based on work reported in AAS (2015), which takes into consideration some of the problems raised for LRH's analysis. I discuss empirical and conceptual problems with this approach as well. In particular I argue that among the class of change of state verbs there are no grammatical properties which successfully distinguish between a purported class of change of state verbs built on roots classified as internally caused from a purported class of change of state verbs built on roots classified as externally caused. In §5 I argue that the class of verbs often listed as internally caused change of state verbs includes a class better analyzed as a special class of substance emission verbs. This class of verbs displays a different argument realization profile from change of state verbs. Once this class is removed we are left with a class of change of state verbs which constitute the core class of verbs which participate in the causative alternation. In §6 I discuss how one can account for the variable obligatory, optional or restricted appearance of the external argument for

causative alternation verbs without reliance on a distinction between internal versus external causation. §7 concludes the paper.

2. A VERB-BASED THEORY OF INTERNAL VS. EXTERNAL CAUSATION

LRH wrote before the distinction between roots and verbs was articulated in linguistic theory, so they did not distinguish between roots and verbs. They are fairly explicit, though, that theirs is a classification of verbs and not events in the world or even event descriptions[5]. More specifically, they take the distinction to be relevant to the lexical representation of verbs as encoding construals of events (happenings in the world). This is made clear in the following quote:

> "The distinction between internally and externally caused eventualities is a distinction in the way events are conceptualized and does not necessarily correspond to any real difference in the types of events found in the world. In general, the relation between the linguistic description of events and the events taking place in the real world is mediated by the human cognitive construal of events, which is what we take our lexical semantic representations to represent." (LRH 1995: 99)

In terms of the semantic explication, LRH have two partially overlapping descriptions of the semantic property the distinction is supposed to capture. The first has to do with the relation between the argument associated with the change and the cause of the change. They write:

> "With an intransitive verb describing an internally caused eventuality, *some property inherent to the argument of the verb is 'responsible' for bringing about the eventuality.* For agentive verbs such as *play* and *speak*, this property is the will or volition of the agent who performs the activity. Thus the concept of internal causation subsumes agency." (LRH 1995:91)

> "This …reflects the nature of internal causation, which *involves causation initiated by, but also residing in, the single argument, and hence dependent on its properties*." (LRH 1995: 94)

The second characterization of the distinction has to do with the nature of the event itself.

> "That is, the changes of state that they describe are *inherent to the natural course of development of the entities they are predicated of* and do not need to be brought about by an external cause (although occasionally they can be, and in such instances causative uses of these verbs are found)." (LRH 1995: 97)

[5] This position can be contrasted for example with what is known about the notion of telicity which is not associated strictly with verbs (many verbs have variable telicity), but is also not a category of actual happenings in the world (the same happening can be described with a telic event description or an atelic event description (Krifka 1998; Rappaport Hovav and Levin 2002; Rothstein 2004). While both telicity and internal/external causation are linguistic categories and not classifications of external happenings, telicity is now known to be a property of event descriptions compositionally built from the verb and its arguments (and modifiers). LRH take internal/external causation to be a classification of verbs. Verbs that show variable behavior with respect to this distinction can be classified either way but it is not possible to derive one kind of event description from another in the way possible with respect to telicity.

LRH suggest a representational distinction between the two classes of verbs which is meant to be connected on the one hand to the semantic explication and on the other to the grammatical behavior the distinction is meant to capture. They argue that internally caused verbs are monadic – they are lexically associated only with the argument whose change is described by the verb.

> "The adicity of a verb is then a direct reflection of a lexical semantic property of the verb, namely, the number of open positions in the lexical semantic representation." (LRH 1995: 95)

In contrast, externally caused verbs are dyadic[6]; they lexically include a cause argument. LRH argue that all alternating verbs are externally caused verbs[7]; the basic lexical representation is then associated with the transitive (causative) variant which reflects the categorization of the verb as externally caused. A subclass of externally caused verbs - those that do not specify anything about the causing event in a causative structure - can undergo a process of lexical binding of the external argument (cf. Reinhart 2000 for a similar analysis). This then is a characterization of the verbs which participate in the causative alternation: externally caused verbs with no semantic restrictions on the external argument. In (12)-(13) we see the correlation between the lack of selectional restrictions on the subject (which is manifest in the range of semantic types of subjects that can appear with alternating verbs) and the ability of a verb to alternate.

12. a. The vandals/The rocks/The strong winds broke the windows.
    b. The windows broke.
13. a. The insurgents/*The poison/*The flood assassinated the president.
    b. *The president assassinated.

The process of lexical binding was taken by LRH to be an operation on the lexical representation of the verbs (cf. in this regard, too, Reinhart 2000, and, for a different approach Koontz-Garboden 2009). The intransitive variant, which is the output of lexical binding, still contains a representation of a lexically bound causal element (Figure 1). The existence of this lexically bound causal element was argued to be diagnosed by the ability of the intransitive variant of a causative alternation verb to appear with the phrase 'by itself' in the sense of "without outside help" (Chierchia 1989/94; LRH 1995).[8]

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[6] While externally caused verbs on their account are always (at least) dyadic, it is not the case that all dyadic verbs are externally caused. For example, agentive verbs are internally caused on the LRH account, but there are dyadic agentive verbs (Levin 1999). Verbs of emission are also internally caused and are dyadic. I elaborate on this further in the next section and in §5. Moreover there are dyadic COS verbs and unaccusative verbs of other kinds which are not externally caused. See Chapter 3 of LRH. Therefore, adicity is not an indication or even a reflection of the relevant kind of causation. See §3.1.2 below.

[7] But not all externally caused verbs undergo the alternation; verbs of destruction such as *destroy, wreck* and *ruin*, and verbs of killing such as *kill, murder* and *assassinate*, are externally caused but do not alternate. See (28) – (30) below.

[8] Schafer (2007) argues in detail that the *by itself* phrase does not have the interpretation argued for by Chierchia (1989/2004) and adopted by LRH. Schafer (2007: 14) claims that the addition of *by itself* stresses that no outside force (a human *agent* or an inanimate *causer*) has acted on its antecedent and thereby caused that its antecedent relates to the event the way it does.

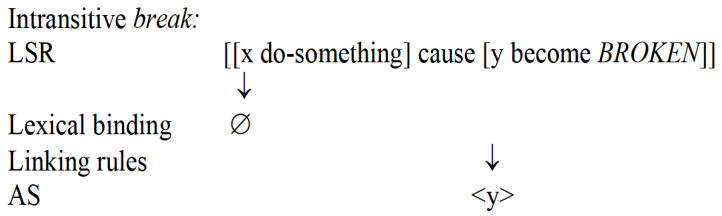

Figure 1: **The input and output of lexical binding, LRH: p. 108**

14. The vase broke by itself.
15. #Mary laughed by herself. (on the relevant interpretation)

On this analysis, internally caused verbs do not participate in the alternation because the alternation derives intransitive verbs from transitive verbs. Internally caused verbs are inherently intransitive, and there is by assumption no rule in English which freely *adds* an argument, only a rule which lexically absorbs an external argument. There is, then, no way to derive the causative variant of these internally caused verbs[9].

LRH adduced further support for their analysis from purported facts about the morphology of the alternation: they cited typological studies (in particular Nedjalkov and Silnitsky 1971; see also Chierchia 1989/1994) which suggest that verbs which they classify as externally caused typically mark their intransitive variants morphologically – either with a reflexive marker or with non-active morphology. They took this to indicate that the morphologically marked variant is the morphologically derived one.

3. Well-known problems for LRH's analysis

The distinction between internally and externally caused verbs has been adopted by many researchers, as we will see. Despite this, the particular characterization and account presented in LRH was subsequently shown to have problems. I review some of the problems which have been pointed out by others and also some which have received less attention.

3.1 Characterizing the classes

3.1.1. Semantic explication One of the most significant problems for this analysis is that it offers no probe for the semantic distinction between internally and externally caused verbs independent of the phenomena the distinction was meant to account for to begin with. The different and intuitively defined explications given above are not based on well-established semantic categories that can be independently identified. These characterizations then do not allow us to test our hypotheses. The following quote drives this point home; see also the quote from the previous section.

16. "B. Levin once heard her landlord say *The pine needles are deteriorating the roof*. Although to our ears this sentence is unacceptable, probably because we conceive of deterioration as always being internally caused, it appears that the landlord's conceptualization was different." (LRH 1995: 99)

The only evidence for different conceptualization of course is the participation of the verb in the causative alternation. The circularity in the argumentation is evident: verbs are

[9] It is true that agentive manner of motion verbs have causative variants (e.g. *The trainer ran the horses around the field*). However, as argued by LRH and others (e.g., Folli and Harley 2006, Alexiadou 2014) this alternation is distinguished from the causative alternation in many respects.

classified in an intuitive way and then when the data go contrary to the classification, verbs are suggested to be either wrongly classified or to allow more than one classification[10].

Another criterion LRH suggest for distinguishing between internally and externally caused verbs is the degree to which the verbs exert selectional restrictions on the argument of the caused event; the idea is that there are much stricter selectional restrictions on arguments undergoing internally caused change than those undergoing externally caused change. This is related to the characterization mentioned above: *"some property inherent to the argument of the verb is 'responsible' for bringing about the eventuality".* In fact, Levin (1993: 246) uses the term "verbs of entity specific change of state" for the class which has come to be called internally caused COS verbs. However, given that externally caused COS verbs also exert semantic restrictions on their objects (after all, as demonstrated by Fillmore 1970 only certain kinds of entities break and they break because of properties internal to them), and I know of no study which actually quantifies the degree to which verbs impose semantic restrictions on their objects, this diagnostic is also of limited value.

Furthermore, for many verbs classed as internally caused, it clearly *is* possible to isolate causes, and they certainly reside *external* to the entity undergoing the change. For example, when seeds sprout, there are surely many causes for this event: the conditions of the soil, the water, the light, etc. All these would be considered causes, for example, under a counterfactual analysis of causation (e.g., Lewis 1973, Dowty 1979).

17. If the seeds hadn't received any water/any light, they would not have sprouted.

On the other hand, seeds do sprout in the natural course of events, even if they have external causes. So, in this particular case it looks like the characterization in terms of natural course of events is relevant. But that would not be true for agentive activity verbs, also considered internally caused verbs; people don't laugh or cry or hesitate in the natural course of events.

This brief discussion shows that the two characterizations mentioned in LRH do not always isolate the same set of verbs and it is still not entirely clear how the characterizations themselves are related to the syntactic behavior (participation in the causative alternation) that the distinction was meant to account for to begin with.

3.1.2. Structural characterization We saw above that LRH made an attempt to link the semantic properties of the different classes of verbs to their adicity. But while externally caused verbs on LRH's account are always (at least) dyadic, it is not the case that all dyadic verbs are externally caused in the sense intended, as already mentioned. There are dyadic agentive activity verbs (like *contemplate*: *John contemplated the idea*; Levin 1999) and agentive verbs on the LRH analysis are internally caused (as internal causation is meant to subsume agentivity). Verbs of emission are also internally caused on LRH's account (LRH: p. 91-93). Emission verbs have two arguments: an emitter and an emittee (as in 18; see §5 for elaboration on the nature of verbs of emission).

[10] LRH were in fact aware of this. They write (p. 100) "What is important is that the nature of the externally versus internally caused distinction leads to expectations about where fluctuations with respect to verb classification both within and across languages may be found." That is, while there is no independently available criterion for diagnosing the distinction, the intuitive characterization, while not making exact predictions, still makes predictions about the general zone where the borderline between the classes is expected to be found. We seek, though, a better characterization of the properties of verbs that fall into this variable zone.

18. a. The wound oozed (blood). Emitter subject (emittee optional)
    b. Blood oozed (from the wound). Emittee subject (emitter optional)

Indeed, with some exceptions, most of these verbs do not have causative variants[11]. Moreover, there are certainly monadic verbs which are internally caused – run of the mill unergative verbs like *swim*, *weep* and *hesitate*. Adicity is also not viable as a characterization of the distinction because there are some externally caused verbs (i.e. those that participate in the causative alternation) which have two internal arguments as in (19), where *the sky* and *clouds* are both internal arguments.

19. a. He [= Aeolus (MRH)] would **clear the sky of clouds** and give beautiful weather.
    https://www.msnucleus.org/membership/html/k-6/wc/weather/k/wcwek_2a.html
    b. I know the **sky cleared of clouds**, and some stars were visible.
    http://www.nuforc.org/webreports/075/S75712.html

Summarizing this section, the two semantic characterizations provided by LRH do not make the same cuts in the data. These characterizations were meant to connect directly to adicity, and adicity to the ability of a verb to alternate. But we have seen that adicity on its own also does not seem to make the correct cut in the data either. I will suggest in §6 that reference to a change developing in the natural course of events is indeed relevant to the appearance or non-appearance of the cause argument with alternating verbs, though it is not in itself a grammatically-encoded distinction and is not once and for all a property of verbs or roots.

3.2 Empirical generalizations

The problems mentioned in the last section have to do with ways of independently characterizing the class without appealing to the participation of the verbs in the causative alternation – which is what the characterization was meant to account for to begin with. But research in the decade following LRH showed that the empirical generalizations which led to the distinction between the two classes of verbs appear not to be quite accurate and led to a refinement of the empirical picture, though not an abandonment of the distinction.

3.2.1 <u>The availability of transitive variants and selectional restrictions</u> A variety of studies (most particularly McKoon and Macfarland 2000 (henceforth M&M) and Wright 2002) have shown that verbs which have been categorized as internally caused change of state verbs (a subclass of the verbs in (10a)) do in fact appear in transitive variants, although there are differences among verbs with regard to their tendency to appear in transitive or intransitive variants. This is seen in Table 1, taken from M&M, which lists some of the verbs classed by LRH as internally caused and the probabilities of a transitive variant for each based on a large corpus study.

[11] See LRH: p. 115-119 for a discussion of causative uses of verbs of emission; Levin, Song, and Atkins (1997) for verbs of sound emission.

INTERNAL CAUSATION VERBS			
	LOW PROB.		HIGHER PROB.
VERB	TRANS.	VERB	TRANS.
bloom	.00	blister	.22
deteriorate	.01	corrode	.63
germinate	.06	erode	.67
rot	.08	ferment	.54
rust	.14	sprout	.26
stagnate	.02	swell	.37
wilt	.06		
wither	.12		
MEAN	.06	MEAN	.45

Note: There were two transitive sentences with *bloom*; rounding makes the entry *.00*[12]

Table 1 Probability of transitive construction – internally caused verbs (McKoon and Macfarland 2000: 837)

But, a similar split in the probability of verbs to appear in the transitive variant occurs with verbs which have been classified as externally caused as shown in Table 2, also taken from M&M.

EXTERNAL CAUSATION VERBS			
	LOW PROB.		HIGHER PROB.
VERB	TRANS.	VERB	TRANS.
abate	.10	dissipate	.41
atrophy	.03	fossilize	.60
awake	.05	fray	.52
crumble	.05	redden	.24
explode	.07	splinter	.49
fade	.01	thaw	.61
shrivel	.11		
vibrate	.03		
MEAN	.06	MEAN	.48

Table 2: Probability of transitive construction – externally caused verbs (McKoon and Macfarland 2000: 838)

Thus, despite what is often claimed (e.g. Alexiadou 2014), the gradience in the probability of verbs to appear in the transitive variant is not a property of the class of internally caused verbs.

Nonetheless, there is a very marked tendency for verbs classified as internally caused to appear with subjects which are not agents in their transitive/causative variant. If we restrict our attention to the uses of these verbs with concrete objects, then the propensity of these verbs to appear with subjects that are not agents might at first blush be taken to be criterial for the classification of the verbs as internally caused. This is nicely illustrated in Table 3, taken once again from M&M.

[12] I do not know what the examples are of transitive uses of *bloom* in M&M's data, but I would not be surprised if they are not causative, but rather uses with an emitter subject and an emittee object (as in (47, 48) below.

	ARTIFACT	NATURE	ANIMATE	ABSTRACT
INTERNAL CAUSE				
blister	6	4	1	
bloom				
corrode		23		3
deteriorate				
erode		7		
ferment		2	2	
germinate				
rot		5		
rust		5		
sprout				
stagnate				
swell		3		2
wilt		1		
wither		7		
TOTAL:	6	57	3	5

Table 3 Subjects of transitive sentences with concrete objects (McKoon and Macfarland 2000: 843)

We see here that the vast majority of subjects of transitive sentences with internally caused verbs have what are classified as 'nature' subjects, i.e. natural entities. This is in marked contrast with verbs which are classified by LRH as externally caused, where the subjects of transitive variants with concrete objects are more evenly distributed among the different semantic categories, according to M&M, as seen in Table 4.

EXTERNAL CAUSE				
abate				
atrophy				1
awake			3	4
crumble		1	5	1
dissipate	3	1	1	3
explode			10	4
fade				
fossilize			1	1
fray				7
redden	2	8	1	8
shrivel		2		2
splinter	5	4		2
thaw	1	7	14	3
vibrate			2	4
TOTAL:	11	23	37	40

Table 4 Subjects of transitive sentences with concrete objects (McKoon and Macfarland 2000: 843)

More specifically, the subjects we find with verbs classified as internally caused when they take concrete objects can be characterized as what can be called "ambient conditions" (Rappaport Hovav and Levin 2012). Further examples appear in (20) – (22).

20. a. Salt air and other pollutants can decay prints. (LN 1982)
    b. The onset of temperatures of 100 degrees or more, on top of the drought, has withered crops. (NYT 1986) (Wright 2002:341)
21. a. *The photographer/*the new method can decay the prints.
    b. *The farmer withered the crops.

22. Light will damage anything made of organic material. It rots curtains, it rots upholstery, and it bleaches wood furniture. (LN)
    b. Salt air rusted the chain-link fences. (LN)
    c. Bright sun wilted the roses. (LN) (Wright 2001:112)

The idea that there is a rather restricted range of subjects for internally caused COS verbs is strengthened by a survey task reported in Wright (2002). She asked subjects to list three typical causers for a variety of verbs normally classed as internally caused and also for a variety of verbs normally classed as externally caused. The difference in results is striking: on average 8.5 distinct causers were listed for internally caused COS verbs, whereas for externally caused COS verbs on average 14.8 typical causers were listed (Wright 2002: 344-345). We return to these data in §6 and suggest an explanation for them.

However, for most verbs which are generally included in the class of internally caused COS verbs, even this property of having a restricted range of subjects in the transitive variant is just a marked tendency. Despite what is often said, they can, under certain conditions, appear with agent subjects (see also discussion in Rappaport Hovav and Levin 2012):

23. I used red onion rather than white and sliced shiitake mushrooms, and **I wilted my kale** just a bit. http://www.eatingwell.com/recipe/250328/hearty-kale-salad/
24. With that, **I withered the** second peach tree, which needed the pollination of the first tree to grow. http://newworcesterspy.net/the-fatherly-guide-to-success/

Furthermore, it emerges from M&M's data that internally caused COS verbs with abstract objects appear much more frequently in transitive variants in comparison to the same verbs with concrete objects, and with a wider range of semantic types of subjects, as illustrated for the verb *erode* below. That is, verbs considered internally caused when they have abstract objects display behavior more similar to verbs considered externally caused. This once again underscores that fact that the properties isolated are not properties of the *verb* per se.

25. **Markets eroded the morals** of the people involved. https://www.huffingtonpost.com/2013/05/13/markets-morals-study_n_3267995.html
26. **He eroded my self-confidence** and my dignity. https://womenintheworld.com/2017/12/19/dustin-hoffman-accusers-share-details-about-his-alleged-abuse-and-its-impact/
27. The financial interests of biotech and drug companies **have eroded the values** of the medical profession... https://www.dailybreeze.com/2012/01/04/helen-dennis-we-have-more-control-over-aging-than-we-think/

This situation holds for all verbs classed as internally caused; with concrete objects they overwhelmingly take ambient conditions as subject, and with abstract objects they take a wider variety of subjects, including agents, abstract entities, states and events. One might want to claim that these verbs have separate lexical entries when taking abstract objects, and that these verbs can be classified as internally caused with concrete objects and externally caused with abstract objects. The idea would be that when COS verbs have abstract objects they are used metaphorically, and their metaphorical uses have separate lexical entries. (One would still have to explain why changes of state with abstract objects are to be considered externally caused.)

It is worth noting, however, that the transitivity options of a COS verb do not necessarily change when a verb is used with an abstract argument, hence understood metaphorically. For example, verbs of destruction have the property of not detransitivizing in English:

28. a. The Romans destroyed/ruined/wrecked the city.
    b. *The city destroyed/ruined/wrecked.

This is feature holds consistently of all verbs of destruction when they take abstract objects as well:

29. a. You destroyed my hopes.
    b. *My hopes destroyed.
30. a. The tension wrecked our relationship.
    b. *Our relationship wrecked.

This seems to indicate that the strong transitivity of these verbs is a grammatical property (Rappaport Hovav 2014). We see, then, that when we isolate a clear grammatical property associated with a particular verb, varying the kind of object and the status of the verb as concrete or metaphorical does not affect that grammatical property. In contrast, it seems that what controls the transitivity of internally caused COS verbs is not a grammatical property.

The conclusion I draw from these data is that it is not a property of the verbs per se that determines the range of subjects allowed, but rather the more specific kind of change the verb describes on a particular use. The exact nature of the change is to a large degree determined by the choice of the internal argument. From this it follows, that, to the extent that there is some kind of linguistically significant classification regarding internal/external causation, it is not a classification of verbs.

Crucially, however, these patterns of variation are not displayed by agentive activity verbs or by verbs of emission. These verbs much more consistently resist causativization, and varying the semantic type of subject does not change the picture significantly[13].

31. a.*I cried/hesitated the interviewee.
    b. I caused the interviewee to cry/hesitate.
    c. *The tense circumstances/my attitude cried/hesitated the interviewee.
    d. The tense circumstances/my attitude cause the interview to cry/hesitate.
32. a.*The bacteria glowed the wounds.
    b.*The wind glowed the embers (Alexiadou 2014: 880)
    c. The wind caused the embers to glow.

Although most studies which discuss internally caused verbs restrict their attention to internally caused change of state verbs, I will nonetheless make explicit what other studies may perhaps assume implicitly: the class of verbs in (10) above is not a uniform class either syntactically or semantically. In particular it is necessary to distinguish the class of internally caused COS verbs from verbs of emission and activity verbs. From herein on, I will focus on the class of verbs which has always been taken to be the core of causative alternation verbs: the class of change of state verbs.[14] This discussion is taken up in § 4. But first we turn to

[13] This generalization seems to be accurate for (aspectually) activity verbs typically predicated of animates. The picture with respect to verbs of emission is a bit different. Certain classes of verbs of emission have occasional causative uses – most strikingly verbs of sound emission, but also some light emission verbs; however these verbs can causativize only when the emission is the result of direct manipulation (Levin, Song, and Atkins 1997). While causativization of COS verbs is subject to a direct causation restriction, COS verbs do not typically require direct manipulation in order to satisfy the direct causation requirement.

[14] Though manner of motion verbs typically predicated of inanimates, like *roll, spin, bounce* and *rock*, are typically classed as externally caused, some of these verbs are less prone to causativization, like

another phenomenon which has been claimed to be correlated with the internal/external causation distinction.

3.2.2 The distribution of (anti)causative morphology Before the introduction of the internal/external distinction in LRH, Haspelmath (1993) introduced the notion of a 'scale of spontaneity'' meant also to account for the distribution of verbs in the causative alternation. Verbs are ordered along a scale of spontaneity as in (33) below.

33. (nonspontaneous) wash < close < melt < laugh (spontaneous)
(externally caused) (internally caused)

Spontaneity is correlated with intransitivity making it similar to internal causation. *wash* is not likely to denote an event which occurs spontaneously and leans heavily toward (is more likely to appear in) transitive syntax; *laugh* is most likely to denote an event which occurs spontaneously and leans heavily toward intransitive syntax. *close* and *melt* can denote spontaneously or non-spontaneously occurring events and so alternate between transitive and intransitive syntax.

Hapselmath (1993) suggests further that the scale is relevant to the distribution and identity of the morphological markings on the variants of the alternation cross-linguistically. In particular, verbs high on the spontaneity scale tend to mark the causative variants morphologically, while nonspontaneous events tend to mark their non-causative variants morphologically, and those that fall in the middle of the scale vary. One issue which remains unclear in Haspelmath (1993) is whether spontaneity is a property of events in the world or properties of sentences (event descriptions). This issue is resolved in later work.

Haspelmath et al. (2014) replace the intuitive notion of spontaneity (which has never been given an explication) with a frequency-based notion. They show that cross-linguistically the distribution of anticausative morphology is correlated with the degree of ***casualness*** of a verb: verbs which tend to appear in corpora more frequently in the causative variant tend to mark their noncausal variants with anticausative morphology.

Significantly, however, this pattern is apparent only at the level of typological survey – it is often difficult to discern the pattern in a given language, since as Haspelmath et al. stress, a wide variety of factors influence the marking of individual verbs in individual languages, including, as they stress "many historical accidents". (p. 25)

Therefore, since the correlation between the morphological pattern and any semantic distinction is not neat, I conclude (as does Haspelmath) that there is nothing in the mentally encoded grammar of the speaker which determines the distribution of (anti)causative marking, making the internal/external causation distinction irrelevant for this.

Summarizing this section, the account in LRH faces conceptual problems in not offering a consistent semantic characterization of the distinction between internally and externally caused verbs, and not offering a semantic characterization independent of the phenomenon it was meant to account for – participation in the causative alternation. But even when looking at patterns of participation in the causative alternation, it appears that there is no classification of verbs as internally or externally caused which correlates with a clearly circumscribed pattern of participation in the causative alternation. We have, however,

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glide and *drift* (Levin 1993: 265). Presumably, the conditions governing the (non)appearance of the cause for this class is the same as for the class of COS verbs.

justified distinguishing the class of COS verbs from other verbs which have been considered internally caused, and from now on, I will concentrate only on the class of COS verbs.

4. A ROOT AND SYNTACTIC EVENT STRUCTURE ACCOUNT

The distinction between different kinds of causation that are lexicalized in verbs was adopted in the Distributed Morphology framework by Harley and Noyer (2000) and Marantz (1997) and further developed by Alexiadou, Anagnastopoulou and Schäfer (2006, 2015; henceforth AAS) and in other work. In this framework, roots, encoding the idiosyncratic semantic core of a lexical item, are clearly distinguished from their "first phase" syntactic environment (Ramchand 2008), which syntactically encodes the event structure properties associated with the word built around the root.

4.1. The causative alternation in a root and syntactic event structure framework

AAS (2006, 2015), present a non-derivational analysis of causative alternation verbs (see also Piñón 2001; Doron 2003 for a similar account in Hebrew and Schäfer 2009 for discussion of these kind of approach), where the two variants of the alternation share a root and the difference between the two variants resides in the amount of structure built on top of the root.

The motivation for distinguishing between the root and the syntactic structure built around the root can be illustrated with the sentences in (34) below. In each case, the contribution of *cool* is constant: it refers to a property concept with specific scalar properties. The varying inferences which can be drawn from each sentence can be derived from the interpretation of the syntactic structures *cool* is integrated into. The element which remains constant is identified as the root. What is striking is that in addition to the fact that the contribution of the root remains constant in all of the structures in (34), the interpretive contribution of the syntactic structure remains constant if the root is changed as in (35).

34. a. The room is cool.
    b. The room cooled.
    c. Donald cooled the room.
    d. The sudden drop in temperature cooled the room.
    e. The room was cooled.
    f. The cooled room.
35. a. The river is narrow.
    b. The river narrowed.
    c. The workers narrowed the river.
    d. Widening the quay narrowed the river beside it.
    https://www.irishexaminer.com/breakingnews/views/analysis/fermoy-weary-of-inaction-as-amenity-crumbles-875697.html
    e. The river was narrowed.
    f. The narrowed river.

In the case of change of state verbs, the causative, anticausative, passive and adjectival passive forms are all built on a root encoding the lexicalized state with the addition of functional layers. The anticausative involves *v* – which categorizes the root as a verb and introduces event implications. The structure of *v* followed by a state root gives rise to a causal interpretation whereby the event is identified as the cause of the result state. The transitive variant involves the addition of Voice which introduces the external argument and bears features relating to agentivity (Kratzer 1996). Passive involves a different feature

specification in Voice than the active transitive, which does not allow the external theta role to be assigned to [spec, Voice]. The adjectival passive adds participial morphology which may attach above vP or VoiceP; it stativizes its verbal complement. See, for example, AAS for details.

AAS, following ideas of Harley and Noyer (2000), take the type of causation to be a property of roots, not verbs. The distinction between internal and external causation is taken to be part of the encyclopedic information associated with a root and which determines the syntactic contexts (amount of structure) minimally needed to be associated with the root when it is realized as a verb. AAS classify COS roots into four different subclasses, which determine the range of syntactic structures built on the roots. The following is the classification of COS roots that they offer, based on ideas from Harley and Noyer.

> **agentive**: (like *murder*): Verbs based on these roots never alternate in any language -- they are always transitive; as a consequence they must always be in a structure with Voice;
> **internal causation**: (like *blossom* and *wilt*): Verbs built on these roots do not alternate in any language and thus must never be in a construction with Voice (this is the position in AAS 2006; later revision reported below).
> **external causation**: (like *kill* and *destroy*): Verbs based on these roots do not alternate in languages like English which do not mark the alternation morphologically, but do alternate in languages like Greek and Hebrew, in which the alternation is morphologically marked. These roots then must appear with Voice but languages differ in the kind of feature specification for Voice which is compatible with these roots.
> **cause-unspecified**: (like *break* and *open*): Verbs based on these roots alternate across languages: the suggestion made by AAS is that when they are transitive they express external causation and when they are intransitive they express internal causation.

I will have nothing to say about agentive COS verbs here. These indeed to not alternate cross-linguistically, and as far as I know this generalization has never been challenged. Nor will I have much to say about verbs like *kill* and *destroy*. Verbs in this class do not alternate in English (though they do in other languages such as Greek and Hebrew), but I suggest that it is less because of the nature of the encyclopedic information associated with the state they encode but rather because it is convenient for languages to have words which describe changes of state having to do with death and destruction whose use entails that the change did not come about in the natural course of events (Rappaport Hovav 2014: 19) but with some identifiable, if not identified, cause.

In Rappaport Hovav (2014: 20-25) I provide arguments against characterizing alternating verbs as being cause-unspecified, that is, as externally caused in the transitive variant and internally caused in the intransitive variant. One argument which brings the point home is the fact that the intransitive variant of a COS verb can come immediately after a clause in which the cause of the change of state is explicitly mentioned as in (36).

36. a. I pounded on the piggy bank and it finally broke.
    b. I leaned against the door and it opened. (Rappaport Hovav 2014: 25)

It is difficult to argue that in these cases the root is being understood as internally caused when an external cause is explicitly mentioned in the previous clause. However if, as I show below, there is no significant distinction between internal and external causation for COS

verbs, then an analysis of the alternation as reflecting internal causation in the intransitive variant and external causation in the transitive variant is not viable and a different account of the alternation must be found.

4.2 Against a structural distinction between internally and externally caused verbs

As mentioned, AAS suggested like others that internally caused verbs do not alternate. Alexiadou (2014), in light of the literature already cited in §3, suggests that there is indeed a distinction between internally and externally caused roots which give rise to internally and externally caused verbs, but what distinguishes between the classes is not participation in the alternation. Rather she claims that internally caused COS verbs are characterized by the following three properties:

(i) There is active morphology on the intransitive variant of the alternation in languages which mark the distinction between active and non-active morphology (i.e., this is a labile alternation);
(ii) The subject is restricted to be a cause (rather than an agent, along the lines discussed in section 3.2.1);
(iii) The transitive variant of the verb cannot passivize.

Alexiadou further suggests that the roots of the class of internally caused verbs themselves are divided into two sub-classes: those which act like regular transitive verbs and those which have the three properties above. The former class is represented by the verb *ferment* and the latter by *blossom*. It is unclear to me what makes verbs like *ferment* different from *externally* caused COS verb (or cause-unspecified verb under that characterization of alternating verbs). I will relate to her analysis of what she calls the *blossom* verbs, which are claimed to display the properties (i) – (iii) above.

On Alexiadou's account there is a structural distinction between the transitive variants of verbs built on internally and externally caused roots. The purported restriction on the subjects of internally caused verbs to be causes (excluding for example agents) is said to follow from the structural position in which the subjects are generated. Her proposal is that the subject of verb built on an externally caused root (and unergative verbs as well) are licensed in [Spec, Voice] and the subjects of verbs built on internally caused roots are licensed in [Spec, vP]. Since *v* introduces, as mentioned, a causal relation, Alexiadou assumes, following Solstad (2006)[15], that the causer subjects of these verbs are a type of "event modifiers". She writes (p. 896):

> A defining property of causers is their inherent eventivity, as they are taken to be responsible for the bringing about of an action or a result ... Natural forces are inherently eventive by definition. Causers name/explicate the event that leads to the resultant state of the theme.

Since by hypothesis cause subjects are generated in *v*P and appear in a structure which lacks Voice, these verbs are expected not to passivize, since passive is a voice alternation and passive morphology is the exponent of a head which appears in Voice. I will show, however, that at least in English, all internally caused COS verbs can appear transitively and can have agentive subjects in their transitive forms. Moreover, they can also passivize. This will lead

[15] According to AAS's analysis *from*-PPs as in *The window cracked from the pressure* are realizations of the PP causers (Schafer 2012), which are also modifiers of the causing event. Internally caused COS verbs, like all other COS verbs, appear with these modifiers, as in *The tents rotted from the sun*.

me to the conclusion that there is no defining feature of a set of roots which give rise to an identifiable class of internally caused COS verbs. The exceptions to this generalization are *bloom, blossom* and *flower,* discussed in §5. I will argue that these verbs should not be analyzed as COS verbs and a more careful look at their argument alternation properties indicates that they are best analyzed as substance emission verbs. This will allow me to maintain the claim that there is no grammatically identifiable distinction between internally and externally caused verbs.

It is not difficult to find agent subjects for almost all verbs which have been classified as internally caused. I bring examples from some of the verbs which did not show any agent subjects in M&M's corpus search. We have already seen examples with *erode, wilt* and *wither* in 3.2.1. Here are examples with some other verbs.

37. I **rusted** the corrugated tin myself with muriatic acid. https://www.pinterest.com/pin/531354456022855000/
38. Last year on Memorial weekend, it was in the 90's here in Michigan and I ended up over watering them, and **I rotted the root system.** https://gardening.yardener.com/showquestion.php?tid=Americana-Geraniums-Thin-Out-And-Do-Not-Bloom-As-Well-After-Transplanting
39. To do this **we decayed the** remaining 80 mCiof NCA [18F]fluoride for several days… in G. Haufe and F. Lerou eds., *Fluorine in Life Sciences*, Academic Press, p. 529.
40. do NOT ever use those tablets. we **corroded** the inside of the tank. http://www.city-data.com/forum/house/117509-toilet-cleaner-2.html

It does seem, however, that with concrete objects, agent subjects are much rarer for this class of verbs than for other change of state verbs, as illustrated in the contrast between Table 3 and Table 4 from M&M's study. I do not know if the results obtained by M&M have been replicated in corpus studies elsewhere, but it is striking that for years researchers thought that these verbs do not have causative variants. This is probably related to the fact that with concrete objects these verbs typically do not appear with agent subjects. In the era when generative grammarians generated most of their own data, checking for the participation of a verb in the causative alternation usually involved coming up with an example with an agent subject and a concrete object as direct object as in pairs like *John broke the vase/The vase broke*. Without context, examples of this sort with the purported internally caused COS verbs sounded consistently bad to researchers.

Assuming the generalization emerging from Tables 3 and 4 is valid (that purportedly internally caused COS verbs tend to appear with cause, but not agent, subjects), the question is how to account for this fact. If the subject of these verbs is always generated in [spec vP] one would expect, on this analysis, that the verbs would only appear with cause subjects. But we saw that this is not the case. We might then hypothesize that the subject is generated in [spec vP] when it is a cause and in [spec Voice] when it is an agent. This hypothesis comes with a clear prediction – there should be a correlation between the nature of the subject and passivizablity of the verb. We should find that the verb can be passivized with an agent argument but not with a cause. However, this prediction is not borne out - it is not at all difficult to find all purportedly internally caused COS verbs in passive, and, moreover, many of these passives appear with causers in the *by* phrase. The causers are argued to be licensed in [spec, vP], and to lack a Voice head. But passive morphology is licensed in Voice – hence the supposed correlation between restriction to causer subject and

lack of passive. The following examples show that this correlation does not hold. Note that the *by*-phrases in these examples refer to the causing event[16].

41. In the Eastern U.S., the dreadful summer of 1955 will be remembered for a long time to come. Beginning in July, **the region was withered by drought and a heat wave,** the worst on record, with temperatures in the 90s for a large part of the month. http://content.time.com/time/magazine/article/0,9171,823875,00.html
42. Beach fill placed in April 2001 at Torrey Pines State Park, located on the border between San Diego and Del Mar, CA about 6 km north of Scripps Submarine Canyon (Fig. 1), **was eroded by a storm** in November 2001.
43. This pole by the food area **was rusted by** the oxidation in the air. https://sites.google.com/site/justinxie712/justin'sweatheringthings?tmpl=%2Fsystem%2Fapp%2Ftemplates%2Fprint%2F&showPrintDialog=1

However, as far as I have been able to ascertain, *bloom, blossom*, *flower* really do not passivize.

I will return to the properties of the purported internal caused COS verbs in §6, where I will offer an account of why these verbs with concrete objects tend not to appear with agent subjects. But first I would like to argue that the verbs *bloom, blossom* and *flower,* which indeed do not passivize*,* form a separate class. I will then relate to the somewhat unique behavior of the verb *sprout*.

5. *BLOSSOM* VERBS AS VERBS OF EMISSION

Careful scrutiny of the grammatical behavior of the verbs *bloom*[17]*, blossom,* and *flower* indicates that they do not show patterns of argument realization typical of COS verbs. I argue that they in fact are not COS verbs but rather constitute a special class of verbs of substance emission; I will call them *blossom* verbs. I will show that they display argument realization properties typical of verbs of substance emission and more generally show behavior typical of unergative verbs and not unaccusative verbs. If they were indeed COS verbs, we would expect them to display grammatical behavior of unaccusative verbs on their intransitive variants.

[16] Alexiadou (2014) also argues that internally caused COS verb display a labile morphological pattern in the alternation (property (i) above in this section), though she does not claim that all verbs showing a labile pattern are internally caused. Indeed, in Alexiadou (2010) there are verbs which are claimed to show a labile pattern of alternation, but are classified as cause-unspecified. Scrutiny of the class of verbs she includes as internally caused COS verbs based on morphological criteria does not convince the observer that these are all indeed internally caused COS verbs. For example, she lists in her (34) verbs such as the Greek counterparts to *thin* and *cool* as internally caused, though I see no semantic reason for this; the argumentation seems somewhat circular, reminiscent of the circularity of argumentation in LRH). Since the event leading to the result state is supposed to represent the cause, one would expect these verbs to appear without Voice, though I see no reason why they could not appear with expletive Voice.

[17] There is a specialized use of the verb *bloom* in the context of coffee-making in which the verb is indeed a change of state verb. There is a process of blooming the coffee: "The bloom is the part of the coffee brewing process in which the gasses from the coffee are released as the water hits the grinds. It causes the grinds to grow & rise. The CO2 that is inside the bean is purged out and replaced with the water and begins the brewing/extraction process."
https://theroasterspack.com/blogs/news/13758377-what-is-the-bloom-and-why-should-you-care

Verbs of substance emission typically have two arguments: an emitter/source and the emitted substance/entity (Levin 1993: 237), though often the non-subject argument need not be explicitly expressed. These verbs show what Levin calls the Substance/Source alternation. Either the emitter/source can be the subject, in which case the emitted substance/entity can be a direct object (44-46a), or the emitted substance/entity can be the subject, and the source expressed in a PP with a source-marking preposition (44-46b; see also Levin and Krejci to appear on weather verbs as verbs of emission).

44. a. The well gushed oil.
    b. Oil gushed from the well.
45. a. The wound oozed pus.
    b. Pus oozed from the wound.
46. a. The faucet dripped water.
    b. Water dripped from the faucet.

In the same way, the *blossom* verbs take two arguments, an emitter – typically a plant or tree - and an emitted entity- a kind of flower or blossom[18]. Since I take them to be verbs of emission, it is not surprising that either the emitted entity or the emitter can be subject; i.e., these verbs show a variety of the Substance/Source alternation. For each verb I give examples of emitter subject and emitted entity subject. Note the source phrases in the emitted entity-subject variant (49, 51). In some of the examples, they take goal phrases, where the source is implicit (53b).

***Bloom* emitter subject**

47. a. **The chinaberry trees** in front of my house **bloomed tiny white flowers**, which fell like snow into the puddles on the sidewalk below. (Dana Sachs, The House on Dream Street, Algonquin Books, Chapel Hill, NC, 2000, p. 61)
48. a. Near the abandoned Islip Speedway, he pointed out a rare alpine family member known as pyxie. A one-inch-wide, low-growing perennial shrub, **it blooms white flowers** in summer. (Anne C. Fullam, "Botanist-Sleuth Searches Out Long-hidden Plants", Section 11LI, New York Times, November 8, 1987, p. 2)

***Bloom* emittee subject**

49. a. **Tiny white flowers bloomed from** the chinaberry tree.
    b. **The bud bloomed from** the branch of a cactus. from *The Girl from: Based on a True Story*, Vanessa Voth, Freisen Press, p. 148

***Blossom* emitter subject**

50. a. They resemble a tomato plant and **each branch has blossomed flowers** on each level of the leaves. https://questions.gardeningknowhow.com/tag/plant-identification-2/page/4/
    b. **The plant will blossom flowers** when light is provided in abundance. https://www.theaquariumguide.com/articles/crinum-calamistratum

[18] It is perhaps not accidental that the blossom verbs are denominal – or are at least zero-related to nouns, all referring to the emitted entity.

***Blossom* emittee subject**

51. a. **The almonds** which **blossomed from the rod** of Aaron for the tribe of Levi**…** https://archive.org/stream/arcanacoelestiah06swed_0/arcanacoelestiah06swed_0_djvu.txt
    b. And he came ... first his head, then his body ... tall and untidy-haired like Harry, the smoky, **shadowy form of James Potter blossomed from the end** of Voldemort's wand. *Harry Potter and the Goblet of Fire*….

***Flower* emitter subject**

52. a. I am not ignorant that 'the Ancients' had frames, probably warmed green-houses--since **they flowered roses** at mid-winter--and certainly conservatories. https://www.gutenberg.org/files/32205/32205.txt
    b. **It flowered about 50 flowers** each plant for the whole season and got a very bad case of blackspot. https://davesgarden.com/guides/pf/go/948/#b

***Flower* emittee subject**

53. a. I am a happy content soul until about November, when the **last flower has flowered** and the soil gets wet and cold. http://www.hoehoegrow.co.uk/2014/01/
    b. Lo & behold this spring it shot out new shoots from the base and **a beautiful bunch of roses flowered forth.** https://www.pinterest.com/suetodd1111/josephine-bonaparte

Furthermore, these verbs show unergative behavior typical of verbs of emission, but not typical of COS verbs. For example, it is well-known that unergative verbs can appear with a variety of non-subcategorized objects, whereas unaccusative verbs do not (LRH 1995 among many others):

54. a**. …**until the plants drooped as though they had **bloomed themselves to death** (Gwen Bristow, "The Handsome Road") https://books.google.com/books?isbn=1480485160
    b. Having **bloomed themselves silly** several weeks ago, the daffodils are now busy photosynthesizing. http://gardenersapprentice.com/gardeningtips/growing-growing/
    c. Asters and golden-rod and Spanish needles had **blossomed themselves** into seedy exhaustion long ago. (Elinor Brooke, "Out of the Fire", The American Magazine 21, 1886, p. 529; https://books.google.com/books?id=ingqAAAAMAAJ; accessed 12/30/2018)
    d. However the original plant transferred to the greenhouse (as insurance?) had **flowered itself to death**. (Trevor Wray, "Orostachys", Northant's News 23.1, Spring 2012, British Cactus and Succulent Society; http://northants.bcss.org.uk/nl231/nl231oro.htm; accessed 12/30/2018)

Once the *blossom* verbs are understood as a subclass of verbs of emission, then the fact that they do not passivize is not surprising – transitive uses of verbs of emission do not passivize either.

56. a. The well gushed oil.
    b. *Oil was gushed by the well.
57. a. The wound oozed pus.
    b. *Pus was oozed by the wound.

I do not provide an explanation for the lack of passivization for these verbs; the important point for me is that the *blossom* verbs pattern like verbs of substance emission. One could, of course claim that these non-agent subjects are generated in [spec,vP] instead of in [spec, Voice] and take this to be the explanation of the lack of passivization. However, the subjects of these verbs are quite different from the cause subjects of COS verbs, and it is difficult to take them to be event modifiers – they are not typically eventive, but rather refer to entities, as can be seen in the examples in (47) – (54). A piece of evidence that the subjects of these verbs are not causers is the fact that these verbs can appear with the source/emitter subject without the second argument. This is shown for standard substance emission verbs in (58) and for the *blossom* verbs in (59). In contrast, purported internally caused COS verbs can in general not appear with the cause argument but without the theme of the COS (60) and (61):

58. The wound oozed (blood) for several days.
59. a. The plant flowered (roses).
    b. The rod blossomed (almonds).
    c. The tree bloomed (tiny white flowers).
60. a. The high tides eroded *(the coast).
    b. The coast eroded (from high tides).
61. a. Oxidation rusted *(the pole).
    b. The pole rusted from the oxidation.

Before concluding this section, I point out that it seems that the verb *sprout* can also be counted among the *blossom* verbs, though it has some properties peculiar to it. In general, it shows the argument alternations typical of the *blossom* verbs:

Sprout emitter subject

62. a. As they grew, **they sprouted buds** and then bloomed. from *Music for Alice*, by Allen Say, Boston, Houghton Mifflin Company, 2004. p. 16
    b. In time **they sprouted buds**, then burst open into papery purple, pink, yellow, or white flowers. https://kiwords.blogs.com/kiwords/2005/05/_this_afternoon.html

Sprout emittee subject

63. a. Many **buds sprouted from the** stumps in April, from "Dormancy and spring development of lateral buds in mulberry", *Physiologia Plantarum* 75.2
    b. **little green sprout** in the spring **sprouted from the earth**
    https://stock.adobe.com/images/little-green-sprout-in-the-spring-sprouted-from-the-earth/128372107

However, unlike other *blossom* verbs, *sprout* does seem to have causative uses (64), and, concomitantly, have passive uses as well (65). Note that the subjects in (64) can range from agents to natural causes, typical of causative uses.

64. a. They simply **sprouted the beans** they carried.
    http://europe.chinadaily.com.cn/epaper/2018-05/04/content_36137499.htm
    b. the company which **sprouted the seeds** is able to trace the batch supplied to the supermarket…
    http://traceabilitytraining.food.gov.uk/module11/overview_1.html#.XDto-FwzbIU
    c. **the warm, rainy weather sprouted the wheat** before it could be gathered.
    https://cdnc.ucr.edu/?a=d&d=SDU18721102.2.32
65. **a. The seeds were sprouted by five sprout producers** and then sold**.**

http://www.outbreakdatabase.com/search/?vehicle=sprout
b. **These beans were sprouted by Vinitha** and they tasted really crunchy!
c. …kumquat blossoms and jasmine. In earlier times, shallot, onion and madder plants **were sprouted by** the same method.
https://www.livinginseason.com/celebrations/chinese-new-year/

These data seem to indicate that *sprout* (which, like the other *blossom* verbs, is zero-related to a noun referring to the emitted entity) is both a COS verb and an emission verb. However, I argue that this is not the case. As pointed in out in LRH (p. 115), there are examples of transitive/causative emission verbs, though they are more sporadic than with COS verbs. The overriding condition on the addition of a cause argument is directness of causation between the causing and caused events. In the case of sprouting, as opposed to blossoming and blooming, the event is one of the first stages in a plant's life cycle. This fact might facilitate the construal of the causing event as a direct cause.[19]

Summarizing this section, it appears that it best to remove the class of *blossom* verbs from the list of COS verbs. These verbs in general can appear in both transitive and intransitive variants, but the transitive variant is not an instance of a COS verb with a cause subject, but rather an emission verb with an emitter subject and a substance/emitted entity as object.

Returning to the class of COS verbs, we have seen in §3 and §4 that there are no grammatical properties which support the distinction between internally and externally caused COS verbs/roots. All COS verbs can in principle participate in the causative alternation; they can appear with the range of semantic types for subject; they can passivize. Let us recall that the distinction between internally and externally caused COS verbs was meant to account for differences in participation in the causative alternation. If we deny the distinction between internally and externally caused COS verbs, we need to provide an account for why verbs do indeed differ in the ways in which they participate in the causative alternation. Some verbs alternate more easily than others; some verbs have more of a tendency to appear in one or other of the variants (as seen in Tables 1-4) and the choice of argument influences the availability of the transitive or transitive variant of the alternation. I address these issues in the next section.

6. SEMANTIC AND PRAGMATIC CONSTRAINTS ON THE EXTERNAL ARGUMENT WITH COS VERBS

I assume that all COS verbs can freely add an external argument which will be interpreted as a cause[20]. For a complete account of the alternation, we need to specify, among other things:

- the semantic constraints on the external argument, when expressed and what they follow from;
- the conditions under which an external cause argument can/must/may not be added.

[19] I thank Beth Levin for enlightening discussion of this point. I should point out that there are other properties of these verbs which deserve more attention. For example, many of them appear in existential *there* constructions. I leave this for future research.

[20] In fact, more work needs to be done on defining the class of verbs which allow an external cause argument. As already mentioned, non COS verbs, such as *roll* and *spin* undergo the causative alternation, and there are stative verbs which also undergo the alternation, though their verbal bases are not COS. These are verbs like *cover, block*, *obstruct* and *sit*. However, it is not the case that all unaccusative verbs undergo the alternation. At least in English, verbs of appearance and existence systematically resist causativization (LRH, chapter 3).

I discuss each in turn here.

6.1 Direct Causation – A Semantic Constraint on the External Argument

The necessary semantic condition on the external argument is that it be construable as a direct cause. The idea that lexical causatives must express direct causation goes back to Fodor (1970), McCawley (1978), Shibatani (1978), and more recently Goldberg (1995), Bittner (1999), Piñón (2001), Wolff (2003) and Levin (this volume). There is a great deal of discussion of the exact conditions which give rise to direct causation. RHL (2012) and Rappaport Hovav (2014) rely on the definition provided in Wolff (2003):

66. ''Direct causation is present between the causer and the final causee in a causal chain: (i) if there are no intermediate entities at the same level of granularity as either the initial causer or final causee, or (ii) if any intermediate entities that are present can be construed as an enabling condition rather than an intervening causer.'' (Wolff 2003:5)

Rappaport Hovav and Levin (2012) and Rappaport Hovav (2014) suggest that this accounts for the fact mentioned in §3 and §4 that verbs typically classified as internally caused have a marked tendency to appear with external arguments which describe ambient conditions and not agents. Recall that this is especially true when the verbs take concrete objects.

67. a.?The workers corroded the steel.
    b. The rust corroded the steel.

In Rappaport Hovav (2014) I provide the following explanation:

68. The most direct causes of such changes are natural forces and ambient conditions which trigger or facilitate these changes. In order to introduce an agent in an event of this sort, the agent would have to precede the natural force or ambient condition in the chain of causation. For the agent to then qualify as a direct cause in the causal chain, the natural force or ambient condition must be considered an enabling condition (part (ii) of (66)), but this is not possible as the agent does not have control over them. (RH 2014: 22)

It is striking that the examples of purported internally caused COS verbs which appear with agent subjects typically describe situations in which the ambient conditions are in the control of the agent, and so the agent can be considered the direct cause under (66).[21] Rappaport Hovav and Levin (2012) provide examples such as in *We germinated the seeds* or *We fermented the wine*. In the examplesin (37)- (40), the immediate causes are instruments under the control of the agent, making them fall under part (ii) of (66). With abstract objects, agents appear as subjects more often (Table 6, page 844 in M&M). If we look at some examples, we might suggest that the intervening events in such cases are more under the control of the agent. For example, (26) appears to be describing a situation in which a manipulative person controls the factors which directly govern the self-confidence of a victim.

[21] There are well-known problems with almost all known formulations of direct causation. See for example Neelman and van der Koot (2012). I assume that a better analysis of direct causation will fall out of a more articulated theory of the pragmatics of the specification of causes and that ultimately the two questions posed at the beginning of this chapter will be answered together by this more articulated theory.

This will explain why the subjects of verbs which describe changes in the natural course of events typically exclude agents as subjects and have ambient conditions as subject. It does not, however, explain why these verbs are overwhelmingly used in their intransitive variants when they take concrete objects. For this, we need a theory which accounts for the (non) appearance of the external argument.

6.2. The (non) appearance of the external argument

Turning to the question of the conditions under which an external cause argument can/must/may not be added, in Rappaport Hovav (2014), I provide a pragmatic account of this (see also more recently Schäfer and Vivanco 2016, who show that transitive and intransitive variants of the causative alternation form scalar pairs). I begin with the following assumption:

69. In the description of a change of state, the cause of the change of state is relevant; therefore, since an utterance which specifies the cause of the change of state is more informative than one which expresses just the change of state, it is to be preferred, all things being equal. (Rappaport Hovav 2014: 23)

When are things not equal? If the cause is recoverable in some way then the sentence with the cause expressed is no longer more informative than the corresponding sentence which expresses just the change of state. In that case, the latter may be preferred from considerations like Grice's (1989) Maxim of Manner. There are a number of factors which may lead to the cause being recoverable. For example, it may have been mentioned previously in the discourse as in:

70. a. In a fit of rage he threw the plate on the floor. We all came to see what happened and saw that it broke.
    b. Using his bare hands and sharpened sticks, Lame Hawk began to tunnel under Nimbock's limp body. He worked tirelessly, ignoring his blistered and bleeding hands and watching with satisfaction as the ditch deepened. http://www.lds.org/ldsorg/v/index.jsp?hideNav=1&locale=59&sourceId=d2623c4445e9b010Vgn VCM1000004d82620a____&vgnextoid=21bc9fbee98db010VgnVCM1000004d82620aRCRD (Rappaport Hovav 2014: 26)

Without the previous context, the intransitive use of *deepen* in (70b) would sound infelicitous. That is, just given the transitive and intransitive uses without any context, the following judgments are gotten:

71. a. They deepened the ditch.
    b.*The ditch deepened.

Or it may be the case, that the speaker does not know the cause, in which case, though the transitive would be more informative, the speaker cannot truthfully specify the cause. Rappaport Hovav (2014) illustrates this with the contrast between following two sentences, taken from McCawley (1978):

72. a. The door of Henry's lunchroom opened and two men came in.
    b. The door of Henry's lunchroom opened and two men went in. (Rappaport Hovav 2014: 22)

The contrast between the two sentences which McCawley discusses is the fact that in (72a), the reader infers that either the men or someone else opens the door, while in (72b) the reader infers that the men did not open the door themselves. The logic behind these inferences stems from the fact that the verb *come* puts the speaker inside the lunchroom, while the verb *go* places the speaker outside the lunchroom. In the first case, then, the speaker inside the lunchroom probably cannot see who it is that opened the door. Therefore, though the agent of the opening is relevant and hence the transitive variant would be more informative, the speaker can leave the agent unmentioned since this situation is compatible with the speaker being ignorant of who opened the door. However, in the second case, with the speaker placed outside of the lunchroom, chances are that the speaker sees the men. In such a situation, if the speaker saw the men, (69) would require the speaker to use the transitive version. Since she does not, one can infer that this is because someone else has opened the door and the speaker does not mention whom, because she cannot see the agent of the opening.

Returning to (69), it appears, however, that not all states are the same with respect to the relevance of the cause of the change of state. Some states are such that they have a propensity to change in the natural course of events. We might put it thus:

73. For a given state and a given entity there is a default expectation of whether the state (or the degree to which the state holds) will or will not change in the natural course of events, i.e., whether the entity has the *disposition* to undergo a change in state. **The cause of a change of state is relevant only if for the given state and the given entity, there is no default expectation of change.**

If a change is expected to happen in the natural course of events, there may be reason in a particular discourse to mention the change, but since the change is expected, no question of the cause arises. What is special about changes of state which have been characterized as internally caused is that they can be considered changes of state which occur in the natural course of events.

If changes of state which have been characterized as internally caused are those which come about in the natural course of events, we can understand the following properties of verbs which express those changes, discussed in the literature (M&M, Wright 2002 and Alexiadou 2014):

74. a. The intransitive variant is most frequent;
    b. The verbs typically occur with a restricted range of subjects;
    c. The verbs are often used with modification and modification improves grammaticality judgments.

(74a) follows from (73) and (74b) from our discussion of direct causation. With respect to (c), Wright (2002) reports that the transitive versions of what are considered internally caused COS verbs are consistently ranked lower in acceptability judgment tasks, and that modification of the subject improves the acceptability rating. The following are her examples.

75. a ?Last July, sunlight wilted the begonias.
    b. Last July, the intense sunlight wilted the begonias.
76. a. ?The past summer, moisture rotted the tomatoes.

b. This past summer, extremely moist conditions rotted the tomatoes. (Wright 2002: 345):

I suggest that the distinction between causal factors and actual causes drawn from discussions of causation in the philosophical literature might give us some insight to this. Changes which come about in the natural course of events typically have a variety of causal factors. For example, a tree grows and a cliff erodes from a variety of factors which are typically co-occurring, common and predictable. For convenience, I use Dowty's (1979) formulation of the distinction between causal factors and actual causes:

77. [Φ CAUSE Ψ] is true iff (i) Φ is a causal factor for Ψ, and (ii) for all other Φ' such that Φ' is also a causal factor for Ψ, some $\neg\Phi$-world is as similar, or more similar, to the actual world than any $\neg\Phi$'-world is.

Most of the causes for internally caused changes of state would fall under Φ' since we assume them to be a part of the world as we know it, which is why the changes they support take place in the natural course of events. For this reason, these causal factors are not good candidates as actual causes. This, I suggest, helps explain why these verbs are used intransitively most frequently. Modification, however, helps pick out one of the causal factors as being unusual or one aspect of the causal factor as being unpredictable or less expected.

It is important to realize, however, that whether or not a verb describes a change which occurs in the natural course of events depends not only on the state lexically encoded in the root, but on the argument the state is predicated of. Moreover, the very same properties which govern whether or not the cause subject is relevant hold of verbs which have been called externally caused change of state verbs when they are predicated of certain kinds of objects. That is, when regularly alternating verbs predicate a change of an entity which comes about in the natural course of events with respect to that entity, then the intransitive version is more felicitous than the transitive version, as in (78).

78. The days lengthened/?The angle of the sun lengthened the days.

However, when "the days" is understood to mean not the number of hours of sunlight, but rather the number of work hours, this change does not come about in the normal course of events, and the transitive version is more felicitous than the intransitive version.

79. But Board of Education members said they lengthened the days to ensure students receive the equivalent of 180 days of instruction. http://news.google.com/newspapers?nid=1957&dat=19960406&id=g4hGAAAAIBAJ&sjid=r-kMAAAAIBAJ&pg=1078,1019911 (Rappaport Hovav 2014: 24)

We find a similar contrast with the verb *broaden*:

80. a. The workmen broadened the street.
b. As she grew older, her face broadened.

These examples bring home the fact that it makes no sense to classify either verbs or roots as internally or externally caused. Rather, there are certain kinds of changes which come about in the natural course of events, and sentence which describe such changes typically do not specify the cause of the change. What can be said about verbs which have been called internally caused is that on their non-metaphorical uses (when predicated of concrete objects), they tend to describe changes which do come about in the natural course of events and therefore they do not usually appear in the transitive use. But when predicated of

abstract entities, the change no longer can be considered one which comes about in the natural course of events, and so the transitive variant will be preferred. Not surprisingly, this is what we see in Table 5, taken from M&M; in their corpus the objects of transitive sentences with verbs they classified as internally caused are overwhelmingly abstract.

	ARTIFACTS	NATURE	ANIMATE	BODY PARTS	ABSTRACT
INTERNAL CAUSE					
blister	3			8	
bloom		1			
corrode	19	1	2	4	22
deteriorate					3
erode	3	4			48
ferment	4				1
germinate					1
rot	2	3		1	2
rust	5				
sprout					
stagnate					1
swell	1	1		3	12
wilt		1			8
wither		7			3
TOTAL:	37	18	2	16	101

Table 5: Objects of full transitive sentences (McKoon and Macfarland p. 841)

The transitive use is made more felicitous if the cause subject describes some unexpected circumstance. Roots or verbs which more easily alternate tend to specify changes which are compatible with a wider range of entities; sometimes the changes they specify then do come about in the natural course of events, but sometimes not[22]. That depends on the entity they are predicated of. However, a blanket statement that alternating verbs appear in the intransitive only when they describe changes which come about in the natural course of events, since, as we have already seen, there may be other reasons for the cause to be either recoverable or not known to the speaker, and hence license the intransitive variant.

7. CONCLUSION

The class of internally caused verbs presented in Levin and Rappaport Hovav (1995) is neither syntactically nor semantically a coherent class. Agentive verbs, verbs of emission and a variety of activity verbs typically predicated of animates show argument realization properties which are distinct from change of state verbs. I have argued that there is no reason to posit a class of internally caused change of state verbs and that the all change of state verbs can receive a unified account with respect to the pattern of their participation in the causative alternation. The verbs which have been called internally caused change of state verb are those which normally describe a change in an entity which comes about in the normal course of events, but this is dependent on what entity the change is predicated of. These verbs tend to be entity specific. The conditions on the (non)appearance of the cause argument can be provided, a component of which is some notion relating to actual causes.

[22] In fact, Levin (1993) calls internally caused change of state verbs ***entity specific***, which describe changes specific to particular types of entities. These are changes which come about in the natural courses of event with respect to these kinds of entities.

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