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A preliminary analysis of causative verbs in English*

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This paper investigates the phenomena that come under the label 'causative alternation' in English, as illustrated in the transitive and intransitive sentence pair *Antonia broke the vase* / *The vase broke*. Central to our analysis is a distinction between verbs which are inherently monadic and verbs which are inherently dyadic. Given this distinction, much of the relevant data is explained by distinguishing two processes that give rise to causative alternation verbs. The first, and by far more pervasive process, forms lexical detransitive verbs from certain transitive verbs with a causative meaning. The second process, which is more restricted in its scope, results in the existence of causative transitive verbs related to some intransitive verbs. Finally, this study provides further insight into the semantic underpinnings of the Unaccusativity Hypothesis (Perlmutter 1978).

1. Introduction

English is particularly rich in verbs with both transitive and intransitive uses where the meaning of the transitive use of a verb *V* can be roughly paraphrased as 'cause to *V*-intransitive'. Such verbs are illustrated in (1) and (2), where the transitive (a) sentences might be paraphrased in terms of the intransitive (b) sentences; that is, as 'Antonia caused the vase to break' and 'Pat caused the door to open'.

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(1a) Antonia broke the vase.
(1b) The vase broke.
(2a) Pat opened the door.
(2b) The door opened.

We refer to this alternation as the *causative alternation* and to verbs with both uses as *causative alternation verbs.*[1]

Such transitive/intransitive pairs have received considerable attention from linguists working in a variety of linguistic frameworks: analyses of this phenomenon have ranged from the primarily syntactic (e.g., Burzio 1986) to the primarily semantic (e.g., Fillmore 1968) and from the wholly lexical (e.g., Wasow 1977, Keyser and Roeper 1984) to the partly lexical (e.g., Borer 1991).[2] There is a sense in which, at least descriptively, the phenomenon is taken to be well-understood, and the same handful of accepted facts regarding this phenomenon are frequently cited.[3] Although the analysis of this phenomenon has been the focus of many studies (see, for example, the references cited in Levin 1993), relatively little has been said about the phenomenon except in relation to the multifarious theoretical concerns it has been used to shed light on.

It turns out, however, that many important questions about the phenomenon itself remain unanswered. And as long as the phenomenon itself is still not well-understood, a complete analysis of the alternation cannot be devel-

[1] Besides the causative alternation, English also has a 'periphrastic' causative, which is expressed with the verbs *make* or *have*, as illustrated in *Antonia made the vase break*. It has often been remarked that the notion of 'cause' that enters into the relation between the transitive and intransitive uses of the alternating verbs allows for a more restricted range of interpretations than that found in English periphrastic causatives. The type of causation associated with the alternating verbs which are the subject of our study is termed direct (or, sometimes, manipulative, contact, or immediate) causation, while English periphrastic causatives allow indirect as well as direct causation (Comrie 1981, Cruse 1972, Nedjalkov and Silnitsky 1973, Shibatani 1976, among others). As we shall see, the type of causative expressed with alternating verbs in English is not available to all verbs, contrasting with the type of causative expressed by the periphrastic causative construction in English, which is generally available. In some languages both direct and indirect causation are morphologically encoded, but in such languages, the two typically involve distinct morphological devices. We refer to the kind of causative we are focusing on in this paper as the lexical causative, since it is usually formed using the lexical resources of a language and shows the hallmarks of a lexical process (Wasow 1977).

[2] The causative alternation has also attracted considerable attention outside the theoretical linguistics literature. It is the subject of a number of studies in psycholinguistics and child language acquisition; see Pinker (1989) for a review of this literature.

[3] Two notable exceptions are Pinker (1989) and Haspelmath (1993).

oped. For this reason, before presenting our analysis of the causative alternation, we provide a survey of certain properties of the causative alternation aimed at providing a contribution towards filling this gap in our understanding. This facet of our investigation focuses on two related questions: (i) Is it possible to delimit semantically the class of verbs which participate in the alternation? and (ii) Do all examples of the causative alternation as defined above represent instances of a single phenomenon? Answers to these questions will not only help us understand the causative alternation itself, but they should also deepen our understanding of the nature of lexical representation and its relation to syntactic structure.

In this paper, we hope to show that the phenomena that fall under the label 'causative alternation' are on the one hand less idiosyncratic and on the other hand less uniform than is typically believed. We suggest that much of the data we investigate is explained once we distinguish two processes that give rise to transitive and intransitive verb pairs.[4] The first, and by far more pervasive process, is the one which forms lexical 'detransitive' verbs from some transitive causative verbs. The second, which is more restricted in its scope, forms causative verbs from some intransitive verbs. With respect to intransitivity, we hope to provide further insight into the semantic underpinnings of the Unaccusativity Hypothesis, the hypothesis proposed by Perlmutter (1978) that the class of intransitive verbs consists of two subclasses, each associated with a distinct syntactic configuration. Finally, as in our previous work, we hope to show that if the relevant aspects of meaning of a verb (or class of verbs) are properly identified, many of the apparent idiosyncratic properties of that verb (or verb class) fall into place.

2. Background: The properties of the alternation

This section sets out the properties of the causative alternation that need to be accounted for. We begin by repeating the often-made observation that

[4] That is, disregarding those verbs which participate in the unspecified object alternation (e.g., the verb *eat* as in *Terry ate her lunch/Terry ate*). In this paper, we also do not discuss the middle construction (e.g., *Bread cuts easily*); this construction involves intransitive uses of transitive verbs which at least on the surface show some similarity to the intransitive variant of the causative alternation. We consider the middle construction to be a distinct phenomenon since it differs from the intransitive variant of the causative alternation in interpretation and other properties (Keyser and Roeper 1984, Ruwet 1972, among others); however, see Hale and Keyser (1987) for an analysis that treats the intransitive variant of the causative alternation as a special case of the middle construction.

there are many verbs in English which occur in the transitive/intransitive pairs characteristic of this alternation. A preliminary list of such verbs is given below.

(3) bake, bounce, blacken, break, close, cook, cool, dry, freeze, melt, move, open, roll, rotate, shatter, spin, thaw, thicken, whiten, widen, ...

Furthermore, the counterparts of these verbs in other languages occur in transitive/intransitive pairs characterized by the same semantic relationship. In some languages, as in English, the relation is not morphologically mediated; see the Basque example in (4).[5] In other languages, the relation is morphologically mediated in some way, as in the French example in (5), where the reflexive clitic *se* is associated with the intransitive member of the pair.[6]

(4a) Mirenek atea ireki du.
Miren-NORK door-NOR open 3sNOR-have-3sNORK
'Miren opened the door.'
(4b) Atea ireki da.
door-NOR open 3sNOR-be
'The door opened.'
(5a) Marie a ouvert la porte.
'Marie opened the door.'
(5b) La porte s'est ouverte.
'The door opened.'

The existence of this phenomenon in a wide range of languages suggests that the causative alternation is not idiosyncratic to English.

Studies of the causative alternation going at least as far back as Jespersen (1927) have suggested that this alternation is found with a semantically

[5] In Basque the change in transitivity is accompanied by a change in the auxiliary accompanying the verb. Simplifying somewhat, the transitive use selects the transitive auxiliary *ukan* 'have', while the intransitive use selects the intransitive auxiliary *izan* 'be'. Thus the difference in auxiliary reflects general properties of Basque and not properties of the alternation. The labels 'NOR' and 'NORK' are the traditional names for the cases associated with the noun phrases in the examples. See Levin (1989) for more discussion.

[6] For more on the morphological relationships between the verb forms in the transitive and intransitive variants of the causative alternation, see the discussion of Nedjalkov (1969) and Haspelmath (1993) at the end of section 4.

coherent class of verbs. In order to determine whether this suggestion receives support, we can ask the following rather simplistic questions: (i) Do all intransitive verbs have transitive counterparts with the appropriate paraphrase? and (ii) Do all transitive verbs with a causative meaning have intransitive counterparts with the appropriate meaning? We begin with a discussion of the first question.

The following examples show that there are undoubtedly intransitive verbs which do not have transitive causative counterparts.[7]

(6a) The children played.
(6b) *The parents played the children.
(cf. The parents made the children play.)
(7a) The actor spoke.
(7b) *The director spoke the actor.
(cf. The director made the actor speak.)
(8a) The audience laughed.
(8b) *The comedian laughed the audience.
(cf. The comedian made the audience laugh.)

These examples might suggest that agentivity is the crucial factor and that agentive verbs do not participate in the alternation, while non-agentive verbs do. As it happens, both suggestions are wrong. There are agentive verbs which do show the causative alternation, as in (9) and (10), and non-agentive verbs which do not, as in (11)–(14).

(9a) The soldiers marched to the tents.
(9b) The general marched the soldiers to the tents.
(10a) The horse jumped over the fence.
(10b) The rider jumped the horse over the fence.
(11a) The cactus bloomed/blossomed/flowered early.
(11b) *The warm weather bloomed/blossomed/flowered the cactus early.
(12a) The neglected wound festered.
(12b) *The heat and dirt festered the neglected wound.

[7] Some English intransitive verbs without transitive causative counterparts are used transitively in the resultative construction, but in this construction such verbs do not have the transitive causative meaning which the alternating verbs have. Consider the verb *laugh* in the resultative construction *The crowd laughed the actor off the stage*. This construction does not mean that the crowd made the actor laugh, which would be the interpretation that would parallel the intended interpretation of (8b), but rather that the crowd laughed.

(13a) The jewels glittered/sparkled.
(13b) *The queen glittered/sparkled the jewels.
(14a) The stream burbled/roared.
(14b) *The rocks burbled/roared the stream.

The examples in (15) and (16) illustrate a further complication involving the transitive use of agentive verbs of manner of motion: the directional phrases which are optional in the intransitive use of these verbs are obligatory in their transitive use.[8]

(15a) The soldiers marched (to the tents).
(15b) The general marched the soldiers to the tents.
(15c) ??The general marched the soldiers.
(16a) The horse jumped (over the fence).
(16b) The rider jumped the horse over the fence.
(16c) ?The rider jumped the horse.

The behavior of the agentive verbs of manner of motion contrasts with that of non-agentive verbs of manner of motion, which, as shown in (17), do not require a directional phrase in either their transitive or intransitive use.

(17a) The ball bounced/rolled (into the room).
(17b) The boys bounced/rolled the ball (into the room).

Although various researchers have commented that the alternation as manifested by agentive verbs of manner of motion is qualitatively different

[8] There may be some disagreement about whether the directional phrases are absolutely necessary in the transitive causative uses of these verbs, particularly with a verb like *jump*. But even if these phrases need not be expressed in certain circumstances, they are always understood in the transitive causative use. A speaker who accepts (16c) still cannot give this sentence the interpretation that the rider made the horse jump in place; rather this sentence receives the interpretation involving the directional phrase: the rider made the horse jump over something. We look at this issue in more detail in section 8, where we also discuss some verbs of manner of motion that do not have causative forms even in the presence of directional phrases.

Verbs of manner of motion are not unique in imposing the directional phrase requirement. The behavior of agentive verbs of position parallels that of agentive verbs of manner of motion in that they can have a causative variant only in the presence of a directional phrase, which gives them an 'assume position' reading: **Maude stood the baby* versus *Maude stood the baby on the table*. We do not discuss this data here because this class of verbs presents a number of complications. See Levin and Rappaport Hovav (to appear) for more discussion of verbs of position, as well as a discussion of a directional phrase requirement that surfaces in certain circumstances with verbs of emission.

from that shown by verbs such as *break* (Cruse 1972, Hale and Keyser 1987, among others), we include this alternation among the data that needs to be accounted for since the general form of the alternation is the same: the transitive and intransitive uses of these verbs differ with respect to the notion of 'cause'. Aside from Pinker (1989), previous researchers have taken the central property of these verbs to be that when intransitive they require agentive subjects, noting that this property appears to be carried over to the object of their transitive causative use. This work disregards the change in status of the directional phrase. In contrast, we believe that the directional phrase is the key to explaining why these verbs show the alternation. On the other hand, the contrast between (15)–(16) and (17) suggests that, although there are agentive verbs which participate in the alternation as we have initially defined it, this alternation may be an instance of a different phenomenon, as we propose in section 8.

Jespersen (1927) calls the class of causative alternation verbs the 'move and change' verbs, because it includes a variety of verbs of motion and verbs of change of state. The list of alternating verbs presented in (3) can easily be divided into two subclasses along these lines:

(18a) bake, blacken, break, close, cook, cool, dry, freeze, melt, open, shatter, thaw, thicken, whiten, widen, ...
(18b) bounce, move, roll, rotate, spin, ...

To the extent that verbs of motion involve a change of position (though not necessarily a translation through space), the set of 'move and change' verbs might be given the unified characterization 'verbs of change'.

This semantic characterization, although on the right track, is nevertheless inadequate. As we will see, change of state verbs do constitute the core of the class of intransitive verbs which alternate. However, to the extent that verbs of manner of motion like *run* are verbs of motion, it remains to be explained why they cannot appear in this alternation without directional phrases (in contrast to non-agentive manner of motion verbs like *roll*). There are also verbs manifesting the causative alternations which cannot be readily characterized as verbs of change. These include verbs of sound and light emission and verbs of position.

(19a) The bell buzzed/rang.
(19b) The postman buzzed/rang the bell.
(20a) The flashlight beamed/shone.

(20b) We beamed/shone the flashlight.
(21a) Tony hung the laundry on the clothesline.
(21b) The laundry hung on the clothesline.

Furthermore, different classes of verbs participate in the alternation to varying degrees, a fact which itself is in need of an explanation. Verbs of change figure most prominently and most regularly in the alternation. Some, though by no means all, verbs of emission – whether they describe the emission of sound, light, smell, or substance – can alternate. We have presented examples that show that among the verbs of light emission, the verbs *beam* and *shine* alternate, but the verbs *glitter* and *sparkle* do not. Similarly, among verbs of sound emission, the verbs *buzz* and *ring* can alternate, but the verbs *burble* and *roar* do not. Verbs of position allow the alternation rather freely. Not only *hang*, but also the verbs *lean, sit,* and *stand* allow the alternation, although a few verbs of position, including *slouch* and *loom*, do not. The behavior of *slouch* is particularly interesting since this verb is rather close in meaning to *lean.*

(22a) The ladder leaned against the wall.
(22b) I was leaning the ladder against the wall.
(23a) The surly youth slouched against the wall.
(23b) *I slouched the surly youth against the wall.
(24a) The bear loomed over the sleeping child.
(24b) *The giant loomed the bear over the sleeping child.

To summarize, our discussion so far has focused on the first question: whether all intransitive verbs have transitive counterparts with the paraphrase appropriate to the causative alternation. We have seen that the intransitivity of a verb is not sufficient to ensure its participation in the alternation. Nor is the semantic notion 'change' sufficient, since although verbs of change are generally found in this alternation, intransitive verbs of other types differ in their behavior with respect to the alternation, even when they are members of the same semantic class. Some other properties besides intransitivity and 'change' must be found, and presumably the properties isolated will help to explain the behavior of the verbs in the different classes.

We turn now to the second question: whether all transitive verbs whose meaning involves a notion of 'cause' have related intransitive uses that lack this notion. Again, the answer is 'no'. There are verbs which meet the semantic criterion, but which do not have related intransitive uses. Examples

include the verb *cut*, which Hale and Keyser (1987) define as in (25), or *kill*, which has been defined – albeit controversially – as 'cause to die' (Lakoff 1970, McCawley 1968, among others).

(25) *cut*: [*x* cause [*y* develop linear separation in material integrity], by sharp edge coming into contact with latter]
(Hale and Keyser 1987: (10))
(26a) The baker cut the bread.
(26b) *The bread cut. (on the interpretation 'The bread came to be cut')
(27a) The terrorist killed the politician.
(27b) *The politician killed.

Verbs close in meaning to *cut* such as *slice* or *carve* do not show the alternation; neither do verbs related to *kill*, such as *murder* and *assassinate*.

(28a) The chief sliced/carved the turkey.
(28b) *The turkey sliced/carved.
(29a) The terrorist assassinated/murdered the politician.
(29b) *The politician assassinated/murdered.

Moving to other domains, verbs of creation also do not participate in the alternation, although creation is sometimes described as 'cause to exist' or 'cause to come to be' (e.g., Dowty 1979: 91).

(30a) Anita Brookner just wrote a new novel.
(30b) *A new novel wrote.
(31a) The contractor built another house.
(31b) *Another house built.

Even more interesting is the fact that many morphologically complex English verbs formed with the suffixes *-ize* and *-ify* lack intransitive counterparts,[9] although these suffixes can be considered to be 'causative' affixes. (In fact, *-ify* comes from the Latin word for 'make/do'.) Consider the examples below:

(32a) The farmer homogenized/pasteurized the milk.
(32b) *The milk homogenized/pasteurized.

[9] This property of *-ize* is also noted by Keyser and Roeper (1984).

(33a) Carla humidified her apartment.
(33b) *Her apartment humidified.

However, some of these morphologically complex verbs have intransitive counterparts of the appropriate type:

(34a) I solidified the mixture.
(34b) The mixture solidified.
(35a) The cook caramelized the sugar.
(35b) The sugar caramelized.

The behavior of *-ify* and *-ize* verbs contrasts strikingly with that of English verbs formed with the suffix *-en*. The suffix *-en* is also arguably a causative suffix, but verbs with this suffix appear to show the causative alternation rather more freely.

(36a) I ripened the bananas./The bananas ripened.
(36b) I loosened the rope./The rope loosened.
(36c) John thickened the sauce./The sauce thickened.
(Lakoff 1968: (37a), (4a))

As part of a study that attempted to identify causative alternation verbs automatically in a machine-readable version of the *Longman Dictionary of Contemporary English* (Procter et al. 1978), Fontenelle and Vanandroye (1989) found that only 14 out of the 82 *-ify* verbs in that dictionary participated in the alternation, contrasting with 46 out of the 84 *-en* verbs. Unfortunately, they did not provide figures for *-ize* verbs, but an examination of the machine-readable version of a comparable dictionary, the *Oxford Advanced Learner's Dictionary* (Hornby 1974), suggests that 14 out of the 78 *-ize* verbs listed as headwords in this dictionary participate in such pairs.[10] The contrasting behavior of these morphologically complex verbs formed with 'causative' suffixes again calls into question the existence of a correlation between the presence of a notion of 'cause' in a verb's meaning and a verb's ability to show the alternation. It appears that neither intransitivity nor a meaning involving 'cause' is sufficient to ensure participation in the alternation.

[10] The small number of *-ify* and *-ize* verbs listed in these dictionaries can be attributed to their intended function: these dictionaries are relatively small dictionaries designed for learners of English. However, a preliminary examination of a more extensive list of such verbs suggests that the number of alternating verbs really is not that high.

Before presenting our own account of the alternation, we turn to an examination of an additional factor that intervenes in determining participation: selectional restrictions. The shared semantic relation between the transitive and intransitive variants of causative alternation verbs has sometimes been demonstrated via the existence of selectional restrictions that are shared by the subject of the intransitive use and the object of the transitive use (Fillmore 1967, among others). For example, only physical objects with certain characteristics can break, a property reflected in the set of possible objects of transitive *break* and possible subjects of intransitive *break*.

(37a) Antonia broke the vase/the glass/the dish/the radio.
(37b) The vase/the glass/the dish/the radio broke.
(38a) *Antonia broke the cloth/the paper/the innocence.
(38b) *The cloth/the paper/the innocence broke.

Assuming that selectional restrictions reflect the meaning of a verb, then this pattern of selectional restrictions reflects the fact that both variants share a common core of meaning.

However, the extent to which selectional restrictions are shared across such pairs is not as great as is often thought. Smith (1970), whose study of the factors that determine participation in this alternation we come back to in section 3, points out that some intransitive verbs that typically do not enter into such alternations may enter into them for certain specific choices of subjects of the intransitive use, as shown in the following examples.

(39a) The baby burped.
(39b) The nurse burped the baby. (Smith 1970: (36a))
(40a) The doctor burped.
(40b) *The nurse burped the doctor. (Smith 1970: (36c))
(41a) The bell buzzed.
(41b) The postman buzzed the bell.
(42a) The bees buzzed.
(42b) *The postman buzzed the bees.

The examples with the verbs *burp* and *buzz* show that selectional restrictions need not be identical for the corresponding arguments in the transitive and intransitive uses. In these examples, the set of possible objects of the transitive use are a subset of the set of possible subjects of the intransitive use.

The lack of common selectional restrictions is even more pervasive. There are also instances of the reverse phenomenon: a verb which when used transitively is found with a set of objects that is larger than the set of subjects the same verb allows when used intransitively. To take one example, consider the verb *clear*, a deadjectival verb that presumably means 'cause to become clear'. This verb is found in causative pairs as in (43), yet, although one can clear a table or a sidewalk, the table and sidewalk can't 'clear', as shown in (44).

(43a) The wind cleared (up) the sky.
(43b) The sky cleared (up).
(44a) The men cleared the table/the sidewalk.
(44b) *The table/the sidewalk cleared.

A similar example involves the verb *peel*. This verb does not alternate at all in its most literal sense 'remove peel from a fruit or a vegetable', although it can be used intransitively to describe the removal of skin – a 'peel'-like covering – from a body part. The intransitive use of *peel* seems even to be preferred in the use in (46).[11]

(45a) I peeled the orange.
(45b) *The orange peeled.
(46a) ?I peeled my nose.
(46b) My nose was peeling.

The examples in (43)–(46) show that for some causative alternation verbs the selectional restrictions on the object of the transitive and the subject of the intransitive do not always coincide exactly.[12] The transitive object or the intransitive subject may show narrower restrictions. Presumably, for those choices of arguments where these do not have transitive or intransitive uses, they lack them for the same reason that some verbs never have them.

To summarize, an account of the causative alternation as defined in the broadest sense must explain why some verbs show this alternation freely, why

[11] This example was inspired by a similar example in Rothemberg (1974), a study of a comparable phenomenon in French, which includes many examples of diverging selectional restrictions.

[12] It is possible that a closer examination of a wide range of verbs may show that the selectional restrictions do not coincide for any verb. For instance, as pointed out by Brousseau and Ritter (1991), there are even senses of the verb *break* where the overlap is not complete: *He broke his promise* but **His promise broke.*

some verbs do not show it at all, and why some verbs show it under restricted circumstances. Finally, such an account must grapple with the issue of whether the data discussed in this section represent a unified phenomenon or not.

3. Towards an account of the alternation

The phenomenon we are dealing with falls under the general rubric of diathesis alternations, alternations which involve changes in the syntactic expression of the arguments of a predicator as well as in its adicity (the number of arguments it requires). Therefore, our account of the alternation should ideally be embedded in a general theory which accounts for the adicity of predicates and the expression of their arguments. We follow much current research on the lexicon (Jackendoff 1990, Rappaport et al. 1988, Rappaport and Levin 1988, Hale and Keyser 1986, 1987; Pinker 1989, among others) in assuming that the properties of diathesis alternations in general can be predicted from the formulation of appropriate lexical semantic representations for the alternating verbs together with a set of linking rules (Carter 1988), rules which determine the syntactic expression of arguments of a predicate. As assumed in much of this literature, we postulate two levels of lexical representation. The first is a lexical semantic representation, a representation of the syntactically-relevant aspects of verb meaning, which probably takes the form of a predicate decomposition. The second is a lexical syntactic representation or argument structure, which encodes the syntactic expression of the arguments of a verb. We assume that the lexical syntactic representation is derived from the lexical semantic representation by a set of linking rules.

Since the causative alternation verbs can be found with either one or two arguments, a question which arises in the context of determining the lexical semantic representation of these verbs is whether they are basically one argument or two argument verbs. That is, are the causative uses formed from the non-causative ones or vice versa? We assume that the basic use of the verb will impose less stringent restrictions on its arguments than other uses since the conditions associated with a derived use might impose additional constraints on the arguments of the verb. In those instances where there are different selectional restrictions on the transitive and intransitive uses, the use with the looser selectional restrictions, if there is one, is the basic one. This means that given the data discussed above, for the verb *buzz* it is the

intransitive use that is basic, but for the verb *peel* it is the transitive use that is basic. The question to be asked in such instances is what aspect of verb meaning determines that *peel* is basically transitive, while *buzz* is basically intransitive.

The selectional restriction criterion still leaves open the issue of those verbs that appear to have similar selectional restrictions for both the transitive and intransitive uses, such as *break* or *open*. (Although given the comment in footnote 12, it is possible that for all verbs the selectional restrictions in one variant are looser than those in the other.) In order to isolate the meaning components which determine the (in)transitivity of a verb, we compare verbs like *break* that permit transitive and intransitive uses, to verbs such as *laugh*, *cry*, or *glitter* that permit only intransitive uses (except perhaps under very special circumstances). (In section 6 we will address the issue of what distinguishes the *break* verbs from transitive verbs like *cut* and *write*, which have only transitive, but not intransitive, uses.) The question is what makes verbs like *break* on their intransitive use different from these other verbs? Here we draw on Smith's (1970) insightful discussion of the semantic factors that play a part in determining which verbs that can be used intransitively have transitive causative uses.

Smith characterizes the difference between those intransitive verbs which do and do not have transitive causative uses by means of a notion of 'external control'. Verbs like *break*, Smith proposes, denote eventualities that are under the control of some external cause which typically brings such an eventuality about. Such intransitive verbs have transitive uses in which the external cause is expressed as subject. Verbs like *laugh* and *cry* do not have this property: the eventualities each one denotes 'cannot be externally controlled' but 'can be controlled only by the person engaging in it'; that is, control 'cannot be relinquished' (1970: 107). Smith takes the lack of a causative transitive use for these verbs and other verbs such as *shudder, blush, tremble, malinger,* and *hesitate*, to be a reflection of the presence of internal control; we return in section 4 to the question of why verbs of internal control should have this property.

(47a) Mary shuddered.
(47b) *The green monster shuddered Mary.
(47c) The green monster made Mary shudder. (Smith 1970: (35a–c))

Similar distinctions have been recognized in other work on English (e.g., Hale and Keyser 1987) and other languages (e.g., Guerssel 1986 on Berber).

For reasons which we explain below, we will not use Smith's notion of 'control' for distinguishing among intransitive verbs which do and do not have causative uses. Rather, we use a related notion, distinguishing between 'internally' and 'externally caused' eventualities. With an intransitive verb denoting an internally caused eventuality, some property inherent to the argument of the verb is 'responsible' for bringing about the eventuality. On this approach, the concept of internal cause subsumes agency. For agentive verbs such as *play*, *speak*, or *work*, the inherent property responsible for the eventuality is the will or volition of the agent who performs the activity. However, an internally caused eventuality need not be agentive. For example, the verbs *blush* and *tremble* are not agentive, but they, nevertheless, can be considered to denote internally caused eventualities, because these eventualities arise from internal properties of the arguments, typically an emotional reaction.[13]

Verbs with an inanimate, clearly non-agentive subject, may also denote internally caused eventualities in the sense that these eventualities are possible because of inherent properties of their subjects. In particular, the notion of internal cause can be straightforwardly extended to encompass verbs of emission. It is an internal physical property of the argument of such a verb which brings about the eventuality denoted by the verb. This property is reflected in the strong restrictions that these verbs impose on possible subjects. For example, only very few things have the properties that are necessary to sparkle, and the same holds for other verbs of emission. Consistent with the classification of these verbs as internally caused is the fact that, as mentioned in section 2, verbs of emission generally do not have causative counterparts, as illustrated in (48). (We return in section 7 to cases in which they do.)

(48a) *The jeweller sparkled the diamond.
(48b) *Max glowed Jenny's face with excitement.
(48c) *We buzzed the bee when we frightened it.
(48d) *The cook bubbled the stew.

[13] The verbs *shudder* and *shake*, which at first glance appear to have the same meaning, present an interesting minimal pair. Only *shake*, and not *shudder*, shows a transitive causative use. Our account would suggest that shaking is externally caused and shuddering is internally caused. This proposal receives support from an examination of the things that can shake and shudder. The two sets are not co-extensive; the set of things that shudder is to a large extent a subset of the set of things that shake. Things that shudder usually can be thought of as having a 'self-controlled' body; they include people, animals, and, perhaps by forced extension, the earth or a car. In contrast, leaves, teacups, or furniture can only shake. This difference, like the internal versus external cause distinction, reflects the way we conceptualize the world.

Since verbs of emission pattern with other verbs without causative counterparts, we use the notion internal versus external cause rather than the notion of control. It seems inappropriate to attribute control to the inanimate emitter argument of a verb of emission.

In contrast to internally caused verbs, verbs which are externally caused inherently imply the existence of an external cause with immediate control over bringing about the eventuality denoted by the verb: an agent, an instrument, a natural force, or a circumstance. Thus something breaks because of the existence of some external cause; something does not break solely because of its own properties. Some of these verbs can be used intransitively without the expression of an external cause, but, even when no cause is specified, our knowledge of the world tells us that the eventuality these verbs denote could not have happened without an external cause.

(49a) The vase broke./Antonia broke the vase.
(49b) The door opened./Pat opened the door.

We thus assume that the intransitive verbs which have transitive uses are externally caused, while those intransitive verbs which do not are internally caused. A closer look at the class of alternating verbs will bear out this suggestion.

The change of state verbs that figure prominently among the alternating verbs describe changes in the physical shape or appearance of some entity that can be brought about by an external cause, be it an agent, a natural force, or an instrument. Many of these verbs are deadjectival; they are based on stage-level adjectives which describe properties of entities that can be caused to change, such as their physical characteristics, color, and temperature (Dixon 1982). Some examples of such deadjectival verbs taken from Levin (1993) are given below in (50); these verbs fall into two major groups, one in which the verbs are zero-related to adjectives, as in (a), and the second in which the verbs are formed from adjectives through the use of the affix *-en*, as in (b).

(50a) brown, clear, clean, cool, crisp, dim, dirty, dry, dull, empty, even, firm, level, loose, mellow, muddy, narrow, open, pale, quiet, round, shut, slack, slim, slow, smooth, sober, sour, steady, tame, tan, tense, thin, warm, yellow, ...
(50b) awaken, blacken, brighten, broaden, cheapen, coarsen, dampen, darken, deepen, fatten, flatten, freshen, gladden, harden, hasten,

heighten, lengthen, lessen, lighten, loosen, moisten, neaten, quicken, quieten, redden, ripen, roughen, sharpen, shorten, sicken, slacken, smarten, soften, steepen, stiffen, straighten, strengthen, sweeten, tauten, thicken, tighten, toughen, waken, weaken, whiten, widen, worsen, ...

The verb *smarten* provides a particularly interesting illustration of the constraints on the adjectives that can serve as the base for verbs. Although the adjective *smart* has two senses, 'intelligent' and 'well and fashionably dressed', the verb *smarten* is related to the second adjectival sense, reflecting the fact that it is typically only in this sense that the adjective denotes a stage-level property, and, hence, a property that might be caused to change.[14] That is, individual-level properties are typically not acquired as a result of an external cause, whereas stage-level properties are.

The distinction between internally versus externally caused eventualities is not relevant only to verbs of change.[15] It also explains the behavior of verbs of position with respect to the causative alternation. As noted above, verbs like *hang, lean, sit,* and *stand* have causative uses, but verbs like *loom* and *slouch* do not. It seems to us that the difference between internal and external cause is the key to their differing behavior. Looming and slouching are postures that are necessarily internal caused, unlike hanging, leaning, sitting, or standing, which are postures that can be brought about by an external cause.

Many studies assume that the intransitive variant of a causative alternation verb is basic and the transitive variant derived. This assumption probably seems justified because the meaning of the transitive verb includes that of the

[14] Betsy Ritter has pointed out to us the expression *Smarten up!* Here the verb is related to the adjectival sense 'intelligent', but interestingly the verb is related to a stage-level use of the adjective. It appears that this adjective, like many other basically individual-level adjectives, can sometimes be used as a stage-level predicate.

Dowty (1979: 129, fn. 4) discusses other instances in which deadjectival verbs lose some of the senses of their base adjective. For example, he notes that although the adjective *tough* can mean either 'difficult' or 'resistant to tearing', the verb *toughen* cannot mean 'make difficult'. We think that the stage-level versus individual-level distinction could be responsible for at least some of the differences in available senses that Dowty cites including the *toughen* example.

[15] There seems to be a gap in the English verb inventory: there appear to be no agentive verbs of change of state. We do not have an explanation for their absence. In fact, we are aware of very few internally caused verbs of change of state at all, and those we have found, such as *flower* and *blossom*, and, in some languages, *blush* are non-agentive. We discuss this type of verb in Levin and Rappaport Hovav (to appear).

intransitive verb. For example, while transitive *break* means 'cause to become broken', intransitive *break* means 'become broken'. We suggest that this is not the case. A scrutiny of the range of verb classes in Levin (1993) reveals that there are no externally caused verbs without a transitive variant. That is, all externally caused verbs have a transitive causative use, but not all of them need have an intransitive use in which the external cause is unspecified (e.g., *write* or *murder*). Given this generalization, we offer the following analysis: internally caused verbs are inherently monadic predicates, and externally caused verbs are inherently dyadic predicates, taking as arguments both the external cause and the passive participant, which is often referred to as the patient or theme. The adicity of the predicate is then a direct reflection of a semantic property of the verb. Externally caused verbs only detransitivize under specific circumstances; we discuss the circumstances that license the non-expression of the cause argument of externally caused verbs in section 6. But it is important to stress that on our analysis externally caused verbs do not undergo a process of causativization – they are inherently causative – but rather a process of detransitivization. Since the majority of causative alternation verbs are externally caused, it is the process of detransitivization that is most pervasive in English.

The following lexical semantic representations for the two types of verbs reflect the type of distinction we suggest.

(51) *break*-transitive: [x CAUSE [y BECOME BROKEN]]
(52) *laugh*: [x LAUGH]

The representation for a verb like *break* is a complex lexical semantic representation involving the predicate CAUSE; it represents the meaning of such verbs as involving two subevents, with each of the arguments of the verb associated with a distinct subevent. The representation for an internally caused verb such as *laugh* does not involve the predicate CAUSE; such verbs have only one subevent and are taken to be basically monadic. We discuss the rules that determine the syntactic expression of the arguments in these lexical semantic representations in the next section. However, it is clear that the intransitive form of *break* involves an operation which prevents the external cause from being projected to the lexical syntactic representation (the argument structure). We do not discuss this operation in this paper, but see Levin and Rappaport Hovav (to appear) for discussion.

In light of the discussion above, certain facts about the formation of causatives across languages cited by Nedjalkov (1969) are not surprising. In

this study, which is based on a survey of 60 languages, Nedjalkov looks at the morphological relation between the causative and non-causative uses of the verbs *break* and *laugh* (as well as two other verbs) in each of these languages. Nedjalkov points out that in the majority of his sample, the transitive causative form of the verb *break* is morphologically unmarked, with the intransitive form being identical to the transitive form (19 out of 60 languages) or derived from this form (22 out of 60 languages). If verbs such as *break* are appropriately characterized as denoting externally caused eventualities, then the monadic use is in some sense derived and indeed morphological marking has a function: it is needed to indicate the non-expression of the external cause.[16]

Nedjalkov also considers the verb *laugh*. As a monadic verb which is internally caused, the verb *laugh* does not denote an eventuality that involves an external cause and can, therefore, be assumed to be basically a single argument verb. In fact, Nedjalkov does not cite any languages in which this verb has a transitive counterpart which is identical in form to or morphologically less complex than the intransitive and which receives a causative interpretation.[17] Nedjalkov reports that in 54 of the 60 languages surveyed, the causative form is morphologically more complex than the non-causative form; see also Hale and Keyser (1987) for discussion of some similar data.

Haspelmath (1993) follows up on Nedjalkov's study and discusses verbs which tend not to show consistent patterns cross-linguistically. For example, verbs corresponding to English *melt* tend to be basically transitive in most languages, with the intransitive form being the derived form, but the opposite pattern is found in a few languages. It is likely that this variability arises because the meaning of a verb such as *melt* is consistent with classification as either internally or externally caused.[18] Pinker (1989) also points out that

[16] Of course, there are some languages where the reverse type of morphology is used to create a dyadic causative predicate from the monadic predicate. 9 of the 60 languages in Nedjalkov's sample show this property. However, it is difficult to tell from Nedjalkov's paper whether the morpheme used to form transitive *break* is that used for the derivation of causatives in general in the languages concerned, although the data Nedjalkov cites in the appendix to his paper suggests that in the majority of the languages it is at least not the morpheme used to form the causative of *laugh*.

[17] Nedjalkov (1969) notes that in those languages where the verb *laugh* has both transitive and intransitive uses, this verb is likely to mean 'laugh at' rather than 'make laugh' when used transitively.

[18] Nedjalkov (1969) also looks at two other verbs, *burn* and *boil*, finding that their behavior with respect to causative formation across languages was much more variable than that of *break* and *laugh*. This variation, like the variation that Haspelmath observes with the verb *melt*, could also be attributed to the variable classification of these verbs.

there are certain classes of verbs which denote eventualities which can be construed on cognitive grounds to be either internally or externally caused. It is precisely with respect to these kinds of verbs that cross-linguistic variation is expected. In fact, appropriately formulated linking rules should predict which kinds of verbs are most likely to exhibit cross-linguistic variation. The distinction between internal and external causation seems to do just this, and we take it to corroborate our approach.

4. Formulating the linking rules

Although the number of arguments that a verb requires in its lexical semantic representation is determined by whether it describes an internally or an externally caused eventuality, we must also posit linking rules that ensure that these arguments have the appropriate syntactic expression. As we describe in Rappaport et al. (1988), we see linking rules as creating the lexical syntactic representation or argument structure of a verb from its lexical semantic representation. As we also outline in that paper, a verb's argument structure in turn relatively straightforwardly determines the d-structure syntactic configuration that the verb is found in. We propose that the following linking rules are among those that determine the lexical syntactic representation of a verb:

(53) *Immediate Cause Linking Rule:*
The argument of a verb that denotes the immediate cause of the eventuality denoted by that verb is its external argument.

(54) *Directed Change Linking Rule:*
The argument of a verb that denotes an entity undergoing a directed change denoted by the verb is its direct internal argument.

We have stated these linking rules in terms of the argument structure notions 'external argument' and 'direct internal argument'; these argument structure positions are then 'projected' into syntax as the d-structure grammatical relations of subject and object, respectively. In the next section we explain why we have stated these rules in terms of argument structure notions that correspond most closely to d-structure grammatical relations rather than to s-structure grammatical relations. In this section we discuss the linking rules and their application to the data we have discussed.

The Immediate Cause Linking Rule is intended to apply to the argument that causes the eventuality denoted by both internally and externally caused verbs. First, we consider internally caused verbs such as *laugh* or *play*. The verb *laugh*'s single argument is the cause of the eventuality that the verb denotes and will be expressed as an external argument as a consequence of the Immediate Cause Linking Rule. This rule will also explain why *laugh* and other internally caused verbs do not have a simple transitive causative use. Such a use would involve the introduction of an additional cause, external to the eventuality denoted by the verb. Such an external cause would have to be expressed as the external argument due to the Immediate Cause Linking Rule. The external cause would thus compete with the verb's own argument for external argument. As a verb has only a single external argument, such causative uses would be ruled out. On this account, the lack of a causative variant for an internally caused verb receives an explanation in terms of the properties of argument structure; this explanation only indirectly appeals to the semantics of the verbs involved.[19]

The only way to introduce an external cause is to express the causative use of internally caused verbs periphrastically. And across languages, verbs like *laugh, cry, speak* or *play* are causativized through the use of a causative affix or verb.

(55a) *The clown laughed me.
(55b) The clown made me laugh.
(56a) *The bad news cried me.
(56b) The bad news made me cry.
(57a) *The director spoke the actor.
(57b) The director made the actor speak.
(58a) *The parents played the children.
(58b) The parents made the children play.

Following Baker (1988), Marantz (1984), S. Rosen (1989), and others, we assume that the causative morpheme or verb comes with its own argument structure, so that the Immediate Cause Linking Rule does not have to

[19] Pinker (1989) points out that internally caused verbs are not expected to have causative uses because the eventuality they denote cannot have an external cause which is at the same time an immediate cause; that is, such eventualities cannot be construed as being directly caused. Although this property is probably implicated in the non-causativizability of such verbs, the existence of internally caused verbs which *do* causativize under certain syntactic conditions, such as those discussed in section 8, suggests that syntactic factors enter into the explanation as well.

associate two arguments from a single argument structure with the same argument structure position. General principles will determine that in languages with causative affixes or verbs the introduced cause will be first in line for being chosen as the external argument in its clause.

The Directed Change Linking Rule is similar in spirit to familiar linking rules which associate a patient or a theme (or an equivalent notion) with the direct object grammatical function (Anderson 1977, Fillmore 1968, Marantz 1984, among others). Our formulation is meant to give specific semantic content to the notions 'patient' and 'theme'. The Directed Change Linking Rule is meant to apply to verbs of change of state and verbs of change of location. This second class includes verbs of directed motion such as *come, go, rise*, and *fall* but NOT verbs of manner of motion such as *roll, run, jog*, and *bounce*. This difference follows because, although the action denoted by a verb of manner of motion inherently involves a kind of change, it is not a directed change. Tenny suggests that there are certain kinds of changes which can be characterized '... as a change in a single parameter or a change on a scale' (1987: 189). We call such changes 'directed changes'. Tenny argues that an argument denoting an entity which is specified to undergo such a change is realized in the syntax as a direct object. This property distinguishes a change of state verb like *dry* from both agentive and non-agentive verbs of manner of motion like *walk* and *roll*. The verb *dry* specifies a change characterizable in terms of a single parameter, dryness, whereas *walk* and *roll* do not specify such a change. In contrast, for verbs of directed motion there IS a directed change: a movement in a particular direction.[20] The argument of a non-agentive manner of motion verb such as *roll* will be a direct internal argument, as we will see, but this linking will be effected by another linking rule. The justification for this will be given in section 7.

The linking rules we have formulated also ensure that when a verb like *break* is used transitively, the external cause will be the external argument, and the patient, since it undergoes a specified change, will be the direct internal argument. When a verb like *break* is used intransitively with only the patient argument, the Directed Change Linking Rule will apply, and this

[20] As formulated here the Directed Change Linking Rule, unlike some other proposed linking rules that are similar in scope, will apply to certain atelic verbs of change, such as *widen* or *cool*. We argue that this property is desirable in Levin and Rappaport Hovav (to appear), where we provide a more detailed comparison of the Directed Change Linking Rule with other linking rules, especially those which make reference to concepts such as telicity. We also compare our approach with one such as Dowty's (1991) which makes use of the rather similar notion of 'incremental theme'.

argument will be the direct internal argument. Since these verbs have s-structure subjects when intransitive, this argument must assume the subject grammatical relation at s-structure, presumably as a consequence of independent syntactic principles. The typical GB-framework account of the expression of the arguments of such verbs makes reference to the Case Filter, Burzio's Generalization, and the Extended Projection Principle (e.g., Burzio 1986); we do not go into details here.[21]

Together the Immediate Cause and Directed Change Linking Rules can be used to predict whether the members of the verb classes that we discussed in section 2 will have causative uses or not. Verbs of change of state are inherently dyadic verbs, so they will always have causative uses, although not as a result of causativization; in section 6 we elaborate on the circumstances in which these verbs can have monadic 'detransitive' uses. Internally caused verbs are not expected to have causative uses, explaining the behavior we observed for verbs of emission; we discuss in section 7 why some verbs of emission nevertheless do have causatives. Agentive verbs of manner of motion, as internally caused verbs, are also not expected to have causative uses. As seen in section 2 these verbs do not typically have causative uses in isolation; we discuss in section 8 why these verbs may have causative uses in the presence of a directional phrase. We attribute the mixed behavior of verbs of position to a split in the class: some of these verbs are internally caused and others are not, and the internally caused verbs are not expected to have a causative use.

These linking rules leave open the question of what happens with an argument that falls under neither of the linking rules introduced in this section. Here we make the assumption, which we justify in Levin and Rappaport Hovav (to appear), that an argument that is not linked by one of these two linking rules will be a direct internal argument rather than an external argument.[22]

(59) *Default Linking Rule:*
An argument of a verb that does not fall under the scope of the other linking rules is its direct internal argument.

[21] See Bresnan and Zaenen (1990) for an account within LFG.

[22] In Levin and Rappaport Hovav (to appear), we argue that verbs of appearance and existence require their own linking rule. We formulate an additional rule that applies to these verbs, linking the argument whose existence is asserted to direct internal argument. The Default Linking Rule is supposed to apply to those arguments that do not fall under the scope of any linking rule, whether it is this additional linking rule or the previously formulated rules, the Immediate Cause and Directed Change Linking Rules.

The Default Linking Rule will apply to the theme (located) argument of transitive *sit, stand* and other externally caused verbs of position, since this argument neither causes the eventuality denoted by the verb nor does it undergo a specified change.[23] We return to the Default Linking Rule in sections 7 and 8, where we illustrate its applicability more fully.

5. The Unaccusative Hypothesis

We have introduced a distinction between internally and externally caused eventualities. As we discuss in greater detail in Levin and Rappaport Hovav (to appear), the two classes of intransitive verbs described here are precisely those that are implicated in phenomena which fall under the rubric of the Unaccusative Hypothesis (Perlmutter 1978). Since the linking rules do not make reference to the adicity of a predicate, they predict that a verb like *break*, even when the external cause is not expressed, still takes a direct internal argument, as can be seen from the application of the linking rules to the representations we introduced above for the two classes of intransitive verbs. With intransitive *break*, only the *y* variable in (51) is expressed; as the argument undergoing a directed change, it will be a direct internal argument, and hence a d-structure object in the syntax. In contrast, the *x* variable in (52), as an immediate cause, will be an external argument, and hence a d-structure subject in the syntax. The syntactic expression of the arguments of these two verbs is given below.

(60a) *break*-intransitive: __ [$_{VP}$ V NP]
(60b) *laugh*: NP [$_{VP}$ V]

Given the definitions of unaccusative verbs as verbs taking a single direct internal argument and unergative verbs as verbs taking a single external argument, the linking rules proposed in section 4 will receive support if there is evidence that internally caused verbs are unergative and externally caused verbs, when monadic, are unaccusative. We review two unaccusative diagnostics that can be used to support this claim; for further discussion see Levin and Rappaport Hovav (to appear).

[23] We do not discuss these verbs further in this paper since a full account of the application of the linking rules to these verbs would require us to introduce certain complications in their behavior. We discuss these complexities in Levin and Rappaport Hovav (to appear). However, we would like to point out that our account suggests that the externally caused verbs of position should be basically transitive.

Work on the Unaccusative Hypothesis has established that the resultative construction can be used as an unaccusative diagnostic (Hoekstra 1984, Levin and Rappaport Hovav (to appear), Simpson 1983, among others). Although both unaccusative and unergative verbs are found in this construction, they pattern differently due to an interaction of verb type with a syntactic constraint requiring the resultative phrase to be predicated of a d-structure object. What matters for our purposes is that when an unaccusative verb is found in the resultative construction, the resultative phrase is predicated directly of its surface subject, as in (61), but a resultative phrase cannot be predicated directly of the surface subject of an unergative verbs, as in (62a). A resultative phrase may only be predicated of the subject of an unergative verb through the mediation of what Simpson (1983) calls a 'fake' reflexive object, as in (62b). Alternatively, a resultative phrase may be predicated of a non-subcategorized object found with an unergative verb, as in (63), an option not available to unaccusative verbs, as shown in (64).[24]

(61) The bag broke open.
(62a) *We yelled hoarse.
(62b) We yelled ourselves hoarse.
(63) The dog barked them awake.
(64) *The bag broke the groceries all over the floor.

Thus the different patterns of the resultative construction correlate with the status of a verb as unaccusative or unergative: a monadic verb which allows a resultative phrase to be predicated directly of its subject is unaccusative, while a monadic verb which allows such a phrase to be predicated of an object – either a 'fake' reflexive or a non-subcategorized object – is unergative.

The closely related X's *way* construction is also an unaccusative diagnostic. This construction, in which a resultative phrase is predicated of the subject of a verb through the use of the phrase 'X's *way*' in object position, is found with unergative verbs, but not with unaccusative verbs (Jackendoff 1990, Marantz 1992).

(65) They worked their way to the top.
(66) *The Arctic explorers froze their way to fame.

[24] See Levin and Rappaport Hovav (to appear) for an explanation of the differential behavior of the two classes of verbs in the resultative construction, and Hoekstra (1992) for an alternative account.

The resultative and X's *way* constructions distinguish internally caused verbs from externally caused verbs as predicted. An examination of the set of tokens of these constructions we have collected over the last few years shows that internally caused verbs like *laugh, play,* and *work* are regularly found in the X's *way* construction and the unergative resultative pattern, while instances of monadic externally caused verbs are attested only in the unaccusative resultative pattern.

The behavior of verbs of emission in the resultative construction is of particular interest since the classification of these verbs has been the subject of controversy. Perlmutter (1978) originally classified these verbs as unaccusative, but this classification has been challenged (see for example Zaenen 1993). We have classified these verbs as internally caused verbs, and hence, we predict that they will pattern with unergative verbs in general, and in the resultative and X's *way* constructions in particular. The examples below verify this prediction.[25]

(67a) The beacons flared the news through the land. (Henderson I 92; cited in K.-G. Lindkvist, *A Comprehensive Study of Conceptions of Locality*, Almqvist & Wiksell, Stockholm, Sweden, 1976, p. 89, sec. 233, 4)

(67b) ... you can't just let the thing ring itself to death, can you? (*Observer*; Trace That Call No More!, *New York Times*, March 8, 1989)

(67c) The very word was like a bell that tolled me back to childhood summers ... (Hers; Child's Play, Women's Sway, *New York Times*, July 17, 1988)

(67d) Then he watched as it gurgled its way into a whiskey tumbler. (M. Grimes, *The Five Bells and Bladestone*, Little, Brown, Boston, 1987, p. 200)

(67e) To counter the unease that was oozing its way between them. (P. Chute, *Castine*, Doubleday, Garden City, NY, 1987, p. 214)

In Levin and Rappaport Hovav (to appear) we look at a wide range of tests and find that they corroborate the results of the two tests that we have discussed in this section, further supporting the linking rules formulated in

[25] Given their unergative classification, we would not expect these verbs to pattern as unaccusative verbs with respect to the resultative construction. In actual fact, some of these verbs are found in the unaccusative resultative construction, but as we discuss in Levin and Rappaport Hovav (to appear) their unaccusative behavior correlates with a shift in meaning, with the additional meaning being one that is typically associated with an unaccusative classification.

section 4. In that work, we also show that there are some verbs which are compatible with both internal and external causation. These verbs include the non-agentive verbs of manner of motion such as *roll* and *bounce* and the verbs of position. As we show in that work, with such verbs external causation is correlated with unaccusative status, while internal causation is correlated with unergative status.

6. When can an externally caused verb detransitivize?

The next question we address is the following: if externally caused eventualities are basically dyadic, when can verbs denoting such eventualities turn up as intransitive, and why is this possibility open to some verbs only for certain choices of arguments? Again we draw on the insights in Smith's (1970) paper to reach an understanding of this phenomenon.

In trying to identify the factors that permit detransitivization (that is, the non-expression of the external cause), it is useful to look at the characteristics of the subjects of externally caused verbs. Among the verbs that never detransitivize are verbs that require an animate intentional and volitional agent as subject, such as the verbs *murder* and *assassinate* or the verbs of creation *write* and *build.*

(68) The terrorist assassinated/murdered the candidate.
(69a) Tony wrote a letter to the editor of the local newspaper.
(69b) That architect also built the new high school.

Smith proposes that the verbs of change that may be used intransitively are precisely those in which the change can come about independently 'in the sense that it can occur without an external agent' (1970: 102). She identifies independence and external control – the notion which we have subsumed under our notion external cause – as the two features which characterize verbs of change. Independence allows for the possibility of intransitive counterparts, and external control or causation allows for the possibility of a transitive causative use. Smith's observation can also be recast as follows: the transitive verbs that detransitivize are those in which the eventuality can happen spontaneously without the volitional intervention of an agent. We believe that this property is reflected in the ability of such verbs to allow natural forces or causes, as well as agents or instruments, as external causes, and, hence, as subjects, as illustrated with the alternating verb *break.*

(70) The vandals/the rocks/the storm broke the windows.

Verbs such as *break* contrast with verbs such as *murder, assassinate, write,* and *build.* These four verbs, as well as any other verbs which, like them, denote eventualities that require the participation of a volitional agent and do not admit natural force subjects, will not detransitivize, despite the fact that their meanings involve a notion of 'cause'.

(71a) *The candidate assassinated/murdered.
(71b) *The letter wrote.
(71c) *The house built.

In fact, these four verbs are among those that require an agent in the strongest sense: they do not even allow an instrument as subject.

(72a) *The knife assassinated/murdered the candidate.
(72b) *The pen wrote the letter.
(72c) ??The crane built the house.

A verb like *cut* shows that the set of verbs that do not detransitivize is not limited to verbs which restrict their subjects to volitional agents. Although this verb does not typically allow natural force subjects, it does allow instruments in addition to agents as subjects.[26]

(73) The baker/that knife cut the bread.

Sentence (74), however, cannot be used to describe the bringing about of a separation in the material integrity of some object.

(74) *The bread cut. (on the interpretation 'The bread came to be cut')

The behavior of a verb like *cut* can receive an explanation. Its meaning includes a specification of the means involved in bringing the action it denotes about, which in turn implies the existence of a volitional agent. Specifically, the very meaning of the verb *cut* implies the existence of a sharp instrument that must be used by a volitional agent to bring about the change

[26] See Brousseau and Ritter (1991) for further discussion of the circumstances that allow verbs to take both instruments and agents as subjects.

of state denoted by the verb. If the same change of state were to come about without the use of a sharp instrument, then it could not be said to have come about through cutting, showing that the choice of instrument makes cutting cutting.

Perhaps the same considerations can explain the behavior of the verb *remove*, which does not have an intransitive form. Its non-existence might seem somewhat surprising since at a first approximation this verb's meaning might be paraphrased as 'cause to become not at some location'. A closer look at the verb *remove*'s meaning reveals that the eventuality it denotes is brought about by a volitional agent, as shown by the oddness of the examples in (75), which have inanimate non-volitional subjects.

(75a) ??The wind removed the clouds from the sky.
(cf. The wind cleared the clouds from the sky.)
(75b) ??The water removed the sand from the rocks.
(cf. The water washed the sand from the rocks.)

We assume that the same factors explain why most morphologically complex verbs formed with the suffixes *-ize* and *-ify* cannot typically detransitivize, as the data repeated here illustrates.

(76a) The farmer homogenized/pasteurized the milk.
(76b) *The milk homogenized/pasteurized.
(77a) Carla humidified her apartment.
(77b) *Her apartment humidified.

Most of these verbs cannot detransitivize, we propose, because they describe eventualities such as being pasteurized or homogenized that cannot come about spontaneously without the external intervention of an agent. It appears to be precisely those *-ify* and *-ize* verbs which allow for this possibility that do detransitivize.

(78a) I solidified the mixture./The mixture solidified.
(78b) The cook caramelized the sugar./The sugar caramelized.

Again, the *-ify* and *-ize* verbs that do and do not permit intransitive uses contrast with respect to the range of subjects they permit when transitive. The verbs that resist detransitivization show a narrower range of subjects when transitive; specifically, they appear to exclude natural force subjects.

(79a) *The rainy weather humidified the apartment.
(79b) The intense heat caramelized the sugar.

If we look more closely at some of the alternating verbs in *-ify* and *-ize* listed in (80), we see that many of these verbs, such as *intensify* or *equalize*, are deadjectival and are very similar in meaning to the previously mentioned alternating deadjectival verbs in (50).

(80a) acetify, acidify, alkalify, calcify, carbonify, emulsify, gasify, intensify, lignify, liquefy, nitrify, ossify, petrify, putrefy, silicify, solidify, stratify, vitrify, ...
(80b) caramelize, carbonize, crystallize, decentralize, demagnetize, depressurize, destabilize, equalize, fossilize, gelatinize, glutenize, harmonize, ionize, magnetize, neutralize, oxidize, polarize, pulverize, regularize, stabilize, vaporize, ...

Other alternating *-ify* and *-ize* verbs are denominal; their meaning may be paraphrased roughly as 'cause to turn into the substance named by the noun that the verb is based on': caramel for *caramelize*, powder for *pulverize*, gas for *gasify*, and so on.

The non-alternating *-ify* and *-ize* verbs also include some denominal verbs whose stems are nouns that name substances: *zincify, carbonize*, and *iodize*. But what is interesting is that the meaning of these non-alternating verbs is different from that of the alternating verbs: it could be paraphrased as 'process or treat using the substance' rather than 'cause to turn into the substance'. We suggest that due to this difference in meaning, these verbs require an agent and hence do not detransitivize. In fact, if *zincify* meant 'turn to zinc' rather than 'process with zinc', we would predict that the verb could alternate, and our own intuitions, as well as those of others we have consulted, is that it would. A preliminary examination of a wider range of non-alternating *-ify* and *-ize* verbs suggests that many describe changes that involve a particular type of processing or treatment, as with the previously cited verbs *homogenize* and *pasteurize* or as with the verbs *sterilize* or *vulcanize*. Other non-alternating verbs involve changes of state that only come about through the active intervention of an agent, such as *legalize* or *sanctify*.

The constraint on detransitivization also explains why some verbs have intransitive uses only for certain choices of patient: it is only for these choices of patient that the change can come about without the intervention of an agent. For instance, in section 2 we noted the following contrasts involving the verb *clear*:

(81a) The men cleared the table/the sidewalk.
(81b) *The table/the sidewalk cleared.
(82a) The wind cleared (up) the sky.
(82b) The sky cleared (up).

Our knowledge of the world tell us that tables and sidewalks are things that are cleared (of dishes and snow, respectively) through the intervention of an animate agent. The sky, however, can clear through the intervention of natural forces, such as the wind. Thus the difference in the possibility of intransitive counterparts.

Similarly, peeling – causing an entity to lose an outer layer – is typically brought about through the actions of a volitional agent, particularly if a fruit or vegetable is involved. However, there are certain entities that lose their outer layers due to natural causes rather than through the action of an agent, and in these instances the verb *peel* can be used intransitively, as in the case of the loss of skin from a person, as illustrated in (84).

(83a) I peeled the orange.
(83b) *The orange peeled.
(84a) ?I peeled my nose.
(84b) My nose was peeling.

The verb *lengthen* can be used to present another contrast of the same type:

(85a) The dressmaker lengthened the skirt.
(85b) *The skirt lengthened.
(86a) The mad scientist lengthened the days.
(86b) The days lengthened.

Typically skirts are only lengthened through the intervention of an agent, and hence the verb *lengthen* as applied to skirts is not found intransitively.[27] Days, on the other hand, become longer as the earth progresses through a certain part of its orbit around the sun, something that happens without the intervention of an outside agent. And *lengthen* as applied to days is typically used intransitively, although in a science fiction context where artificial

[27] Of course, it is possible to construct contexts in which a skirt might be lengthened by being washed. As Mary Laughren has pointed out to us, the intransitive use should be possible in such circumstances.

manipulation of the length of days is possible, transitive uses are also found, as in (86a). These examples show yet again that detransitivization is possible precisely where an externally caused eventuality can come about without the intervention of an agent. In this sense, detransitivization is a productive process, since it appears to be possible wherever this condition is met.

In trying to pin down a verb's transitivity, we have suggested that verbs can be categorized according to whether or not they denote an eventuality with an external cause and according to whether or not they denote an eventuality which can occur spontaneously. Since these two distinctions are rather similar, we might ask whether there is any need to distinguish between them. In fact, Haspelmath (1993) has independently developed an analysis similar to the one we present here, except that he does not make a clear distinction between the two notions. Although Haspelmath is not explicit about this, it appears that he takes the likelihood of spontaneous occurrence for an event to be the opposite of external causation for that event. It seems to us that there is evidence favoring our approach, which takes the two notions to be distinct. Haspelmath links the likelihood of spontaneous occurrence to intransitivity, without distinguishing between unaccusative and unergative intransitive verbs as we do. For Haspelmath, those verbs which denote events which are likely to occur spontaneously will have an intransitive form, while those which are not likely to occur spontaneously will have only a transitive form. However, Haspelmath does note that across languages certain intransitive verbs like *break* tend to be the morphologically marked member of a causative alternation pair of verbs, while others like *laugh* tend to be the morphologically unmarked member. It turns out, as he notes, that those verbs which, like *break*, are both spontaneously occurring and externally caused, are the ones which tend to have the intransitive form as the morphologically marked one. Those which, like *laugh*, are spontaneously occurring and internally caused tend to have the transitive member of a causative alternation pair morphologically marked. This difference justifies the retention of both notions. In some sense, Haspelmath's study provides cross-linguistic corroboration of the results we obtained from the in-depth study of a single language.

7. Why can some internally caused verbs have a causative use?

We now return briefly to the question of why some internally caused verbs sometimes have causative uses. For instance, in section 2 we discussed how

the verbs *burp* and *buzz*, which we have seen are internally caused, can be used transitively for certain types of arguments, as in the examples below.

(87a) The nurse burped the baby.
(87b) *The nurse burped the doctor. (Smith 1970: (36a,c))
(88a) The postman buzzed the bell.
(88b) *The postman buzzed the bees.

This phenomenon is sparsely and unevenly distributed across the English verb inventory. For instance, the verb *burp* may be the only bodily process verb with a causative transitive use. The existence of causative transitive uses is somewhat more widely attested with verbs of emission, particularly verbs of sound emission. This property might be attributable to the fact that, unlike verbs of bodily process, verbs of emission are typically predicated of inanimates; therefore, some verbs of emission can describe either internally or externally caused eventualities. Among the verbs of emission that can be used transitively are a few verbs of light emission, including *beam* and *shine*, and a somewhat larger number of verbs of sound emission, including *buzz, jingle, ring*, and *rustle*. The verb *buzz* describes a type of sound that is emitted by certain animals – bees – or by certain types of devices – bells and buzzers. This verb can only be used transitively when the emitter of the sound is a device, and only if the device can be caused to emit the sound through direct manipulation by an external cause. Similarly, the verb of light emission *beam* may be used transitively when the object of the verb is a flashlight, again a manipulatable device, but not a person's face.[28]

(89a) He beamed the flashlight in the dark.
(89b) *He beamed her face with satisfaction.

The following generalization appears to hold of all the verbs of emission with causative transitive uses: they can be used transitively only with an emitter that is directly manipulated by an external cause, and when used in this way, the interpretation must be one in which the emission is directly brought about by an external cause. There are fewer verbs of light emission

[28] Steve Pinker has pointed out to us that the transitive use of verbs of light emission generally has a meaning which includes 'aiming in a particular direction', rendering a directional phrase either obligatorily present or at least understood. He suggests that perhaps the analysis of these verbs should be similar to the one we propose for the causative forms of the agentive verbs of manner of motion in the next section.

with transitive causative uses than there are verbs of sound emission since in most instances the entities of which verbs of light emission are predicated emit light without the intervention of an external cause, unless these entities are devices. More verbs of sound emission than verbs of light emission are predicated of entities which emit a sound only under manipulation by an external cause. Some verbs of emission, such as *sparkle* and *burble* cited in section 2, never have causative transitive uses. It is unclear to us at this point whether some verbs of emission lack causative uses because they denote eventualities in which causation simply cannot be assumed by an external cause – that is, they are necessarily internally caused – or because, even though external causation may be possible, the set of verbs denoting eventualities compatible with both internal and external causation is explicitly learned from examples.

We can now propose an explanation for why *burp* is apparently the only verb denoting a bodily process with a transitive causative use. One of the few feasible instances of external causation of a bodily process is burping as it applies to babies. Babies are incapable of burping by themselves, so that the person caring for the baby must assume control of the burping. Thus the verb *burp* can be used transitively only when babies are involved.

We propose then that the eventualities denoted by a small number of English verbs are compatible with either internal or external causation, giving rise to both an intransitive use and a transitive causative use of these verbs. Since the causative use, when available, is associated with direct manipulation of the emitter by an external cause, we assume that in such instances the emitter is no longer viewed as the cause of the eventuality, and that the only cause is the external cause which manipulates the emitter. The Immediate Cause Linking Rule will apply to the external cause, so that it will be the external argument. The Default Linking Rule will apply to the emitter, since it does not meet the conditions on the other linking rules, and it will be the direct internal argument.

As mentioned earlier, certain verbs of manner of motion have meanings compatible with either internal or external causation. These verbs include the set of verbs of manner of motion which are not necessarily agentive, such as *swing, bounce,* or *roll.* In Levin and Rappaport Hovav (to appear) we provide evidence that a verb like *roll* is in fact unaccusative when predicated of an inanimate entity, as in *The ball rolled (on the floor)*, but unergative when used agentively, as in *The dog rolled (on the floor)*. This behavior is just what our analysis predicts. When internal causation is involved, the Immediate Cause Linking Rule will ensure that the single argument, as the internal

cause, will be the external argument, and the verb will be unergative. When external causation by an agent or a force, such as a push or gravity, is involved but no overt cause is expressed, the single argument will be the direct internal argument due to the Default Linking Rule, and the verb will be unaccusative. (The Directed Change Linking Rule does not apply since there is no directed change; the verb *roll* is atelic in the absence of a directional phrase.)

8. The interaction of directional phrases and transitivity

In this section we return to the last type of causatives mentioned in the survey in section 2: the causative uses of agentive verbs of manner of motion such as *march* and *jump*, illustrated in examples (15b) and (16b), which are repeated below.

(90a) The general marched the soldiers to the tents.
(90b) The rider jumped the horse over the fence.

These verbs are internally caused monadic predicates. By the linking rules, their single argument should be an external argument; therefore, contrary to fact, these verbs are not expected on our analysis to have the transitive causative uses which some of them do manifest. In this section we provide an account of why some members of this set of internally caused verbs have causative uses.

In the process, we will also provide an answer to another question that is posed by the linking rules that figure in our account of causatives. We have formulated two linking rules which associate arguments with the notion of direct internal argument, and one which associates arguments with the notion of external argument. Since one of the rules linking arguments to direct internal argument is a default rule, a natural question to ask is why we need the other rule that links arguments to direct internal argument, the Directed Change Linking Rule, at all. Couldn't the Default Linking Rule alone yield the same results? For example, if we dispensed with the Directed Change Linking Rule, the Default Linking Rule could be applied to the verb *break* with the desired result. This section explains why both linking rules are needed. We illustrate the necessity of the Directed Change Linking Rule using the behavior of agentive verbs of manner of motion with respect to causativization.

We propose that the key to understanding the unexpected behavior of the agentive verbs of manner of motion is the fact that in English, such verbs can be used as verbs of directed motion in the presence of a directional phrase (Talmy 1975, 1985, among others).

(91a) The soldiers marched to the tents.
(91b) The horse jumped over the fence.

When an agentive verb of manner of motion is used in a directed motion sense, then both the Immediate Cause Linking Rule and the Directed Change Linking Rule are applicable to the agentive argument. If we assume that the Directed Change Linking Rule takes precedence over the Immediate Cause Linking Rule – something that a default linking rule could by definition not do – then the single argument of a verb like *run* would be a direct internal argument when the verb is used in a directed motion sense. And indeed many studies of unaccusativity have established that English agentive verbs of manner of motion are unaccusative in the presence of a directional phrase.[29]

Given the unaccusativity of these verbs with directional phrases, it is possible to give an explanation for why agentive verbs of manner of motion may have a transitive causative use when they are unaccusative: there is no external argument, so that the external cause can be linked to external argument. Since this alternative linking, which allows us to explain the existence of the causative use of these verbs, cannot be accomplished by a default rule, we do not dispense with the Directed Change Linking Rule. This account also explains why a directional phrase is needed or – at the very least – understood when agentive verbs of manner of motion are used causatively. The presence of such a phrase sanctions the alternative linking of the theme argument that permits the introduction of an external cause, explaining the contrasts below.

(92a) The general marched the soldiers to the tents.
(92b) ??The general marched the soldiers.
(93a) The rider jumped the horse over the fence.
(93b) *The rider jumped the horse.

The example in (94) shows that a phrase with a directional interpretation, and not any type of locative phrase, is needed for the causative use.

[29] We do not repeat this evidence here; see Hoekstra (1984), L. Levin (1986), Levin and Rappaport Hovav (1992), C. Rosen (1984), among others.

(94) ??I ran the mouse around the box.

This example is unacceptable on the locative interpretation, which would involve the mouse running aimlessly around inside the box, but it improves on the directional interpretation where the mouse runs around the perimeter of the box. The constraint against locative phrases reflects the fact that only directional phrases allow for a directed change.

The process which makes manner of motion verbs into verbs of directed motion is fully productive in English. Therefore, we would expect that the process which transitivizes these directed verbs of manner of motion to be fully productive as well, so that all class members should have a transitive causative use in the presence of a directional phrase.[30] In fact, a wide variety of agentive verbs of manner of motion are attested in causative uses with directional phrases.[31]

(95a) ... several strong Teamsters ... shuffled Kit out of the room ... (L. Matera, *A Radical Departure*, 1988; Ballatine, New York, 1991, p. 79)
(95b) "... I promised Ms. Cain I would ride her around the ranch ..." (N. Pickard, *Bum Steer*, Pocket Books, New York, 1990, p. 92)

However, some of these verbs do not seem to have such causatives.

(96a) *The trainer jogged the runners to the finish line.
(96b) *The leader climbed the team to the summit.

[30] This account leaves unexplained the fact, noted also in Pinker (1989), that verbs of directed motion which are not verbs of manner of motion do not have causative counterparts: **She arrived the package (at the store)*. We believe that the lack of causatives with these verbs may not be a problem for our account of causatives of verbs of motion. We suspect that these verbs are best not characterized as verbs of motion for several reasons, but rather they should be considered verbs of appearance. Interestingly, verbs of appearance, for reasons that we do not fully understand, do not permit causative uses: **The magician appeared a dove (from his sleeve)*. Pinker suggests that the semantic conditions we formulate here are only necessary conditions for participation in the alternations. He proposes that membership in lexically specified semantic subclasses of verbs determines the sufficient conditions for participation in diathesis alternations in general. These subclasses are implicated in what Pinker calls narrow-range lexical rules. It remains to be seen whether the lack of causative uses for certain classes needs to be stipulated lexically as Pinker suggests or can be shown to follow from more general principles.

[31] It is clear from the context that in (95b) the riders are actually on separate horses; that is, the example does not have the accompaniment interpretation found in sentences such as *I walked my dog*, which might be argued to instantiate a distinct phenomenon from the phenomenon being discussed here.

The unavailability of certain causatives can be attributed to the Immediate Cause Linking Rule itself, which is formulated in terms of immediate causation. All of the sentences with transitive causative uses of agentive manner of motion verbs imply some sort of coercion (a fact also noted in Pinker 1989). In fact, in the absence of a particular context, these verbs sound best when the subject is human and the object is an animal, or else when the subject is someone in a position of authority and the object is under that authority. We attribute these preferences to a need to construe such examples in a way that the subject can be interpreted as the immediate cause of the eventuality. Some verbs of manner of motion describe types of motion that do not lend themselves to an interpretation involving coercion, and such verbs are unacceptable in the causative use. This additional condition on causativization is illustrated by verbs that describe aimless motion, such as *stroll, mosey, meander* and *wander*. Typically aimless motion cannot be brought about by coercion and, indeed, these verbs appear not to have a causative use.

(97) *We strolled/moseyed/meandered/wandered the visitors (to the museum).

However, a search of text corpora did yield the following example of a causative use of *stroll*, suggesting that in the right circumstances even these verbs can causativize, although a reviewer found this example unacceptable, as our analysis would suggest.

(98) Julie Smith will stroll you through the Garden District, in *New Orleans Mourning* ... (*New York Times*)

On this account, agentive verbs of manner of motion enter into a real process of 'causativization', in the sense that the causative form is the derived form. The account of the causative forms of these verbs contrasts with that of the causative forms of verbs like *break*, which we have argued are basically dyadic and enter into a process of detransitivization. This analysis, as we mentioned in section 3, is corroborated by the fact, noted in Hale and Keyser (1987), that cross-linguistically it is the causative form of such verbs which tends to be morphologically marked.[32]

[32] Another fact which suggests that the process involved with verbs of manner of motion is different from the one involved with verbs of change of state is pointed out by Reinhart (1991). She notes that the introduced subject in a transitive use of a verb of manner of motion must be an agent, not an instrument or natural force. Compare *The rider jumped the horse over the fence* with **The whip/the lightning jumped the horse over the fence*. This property is also noted in Cruse (1972).

Our account of the transitive use of verbs of manner of motion is different from our account of the transitive use of verbs of emission. We have claimed that certain verbs of emission can be construed as being externally caused; because of that, a directional phrase is not required to effect a change from an unergative to an unaccusative verb. In contrast, verbs of manner of motion are never really considered externally caused, so that a directional phrase must be introduced to effect the change in the classification of the verb from unergative to unaccusative. The introduction of the new external cause is constrained in that the external cause must somehow be construed as an immediate cause. In fact, as we discuss at greater length in Levin and Rappaport Hovav (to appear), even with certain inanimate emitters, the emission of the sound does not come about by direct manipulation of the emitter, so that causatives are only possible in the presence of a directional phrase (e.g., *The driver roared/ screeched the car into the driveway*). That is, the situation reduces to precisely the situation observed with agentive verbs of manner of motion.

The crucial part that the directional phrase plays in sanctioning the causative use of agentive verbs of manner of motion is brought out by comparing the behavior of the verbs *run* and *roll*. The verb *roll*, although a manner of motion verb, is not necessarily agentive and falls rather into Jespersen's 'move' class. As discussed at the end of section 7, the type of motion that *roll* denotes can be either internally caused or, when brought about by an agent or a force such as a push or gravity, externally caused. Depending on whether the verb *roll* is understood as internally or externally caused, monadic *roll* would be predicted to behave either as an unaccusative or as an unergative verb. When the verb takes an animate agentive argument, it would be expected to show unergative behavior since the rolling would be internally caused. In fact, when the verb takes an animate subject, it can be found in the prepositional passive construction, a construction that Perlmutter and Postal (1984) argue is only possible with unergative verbs.

(99) This carpet has been rolled on by three generations of children.

When its argument is inanimate, the eventuality denoted by the verb would be externally caused. The argument would be an internal argument by the Default Linking Rule, since neither of the other two linking rules would be applicable, and the verb would be expected to show unaccusative bahavior. In fact, the verb cannot be found in an unergative type resultative construction with an inanimate subject, as shown in (100a), though it can be found in an unaccusative type resultative construction, as shown in (100b).

(100a) *The bowling balls rolled the markings off the floor.
(cf. The basketball players dribbled the markings off the floor.)
(100b) The door rolled open/shut.

This account of why *roll* can be unaccusative does not make reference to a directional phrase, contrasting with the account of why *run* can be unaccusative. However, like unaccusative *run*, unaccusative *roll* should allow for a causative counterpart, though again without the necessary accompaniment of a directional phrase. As predicted, the verb *roll* can be used causatively even in the absence of a directional phrase.

(101a) The bowling ball rolled (into the room).
(101b) The bowler rolled the bowling ball (into the room).

The contrasting behavior of the verbs *roll* and *run* supports our account of these two verbs.

9. Conclusion

In this paper we have unravelled some of the puzzles concerning the causative alternation. Central to our analysis is the distinction between verbs which are inherently monadic and verbs which are inherently dyadic. This distinction is related to – but not reducible to[33] – the distinction between unaccusative and unergative verbs. With respect to the phenomena that have come under the label 'causative alternation', we have suggested that the more productive process in English is one which forms 'detransitive' verbs from lexical transitive causative verbs, as in the case of the verb *break*. Some verbs, such as *buzz* have both transitive and intransitive uses since the meaning of the verb is compatible with both internal and external causation; this phenomenon is restricted only to those verbs which are indeed compatible with both interpretations. Transitivization of agentive verbs of manner of motion involves the introduction of an agent to an inherently monadic verb when, due to the presence of a directional phrase, the verb no longer takes an external argument. We hope that this study of causative verbs in English will help to illuminate our understanding of the much discussed, though still elusive, notion of transitivity.

[33] We argue in Levin and Rappaport Hovav (to appear) that verbs of inherently directed motion such as *arrive* are unaccusative and monadic.

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