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# A Study of Inanimate Unergatives

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**Abstract**

A set of unergative verbs (emission verbs such as *ring, flash, glitter* and *whistle* are their typical representatives), commonly analyzed as involving an externally mapped theme role, poses a challenge to argument realization theories. Two main problems arise regarding this set. The first problem concerns mapping: if these verbs are thematically indistinguishable from unaccusative verbs, why do they map their subject externally, while unaccusatives map their subject internally? What constraint or grammatically relevant feature is required to account for the different merging results? The second problem is that a subset of these unergatives has a transitive alternate: *The doorbell rang / The postman rang the doorbell.* What is the relationship between the transitive and the intransitive alternates? What process is responsible for this alternation?

I intend to show that treating these unergative verbs as having a theme role is untenable. I first propose that this set of unergatives, unlike the set of unaccusatives, has a causal implication: their subject is not a theme, but rather an inanimate cause role. This is based on an experiment which I designed, aimed at diagnosing a causal component of meaning. The results of the experiment show the division of unaccusative verbs and unergative verbs into two separate groups, supporting the claim that a causal component is present in the latter but is absent in the former.

The solution of the second problem directly follows from the solution of the first: when an agent is also available in the concept, it may be realized externally while the subject of the intransitive is realized internally, giving a transitive alternate. This type of alternation is familiar: instruments (which are an instance of an inanimate cause role) of the so-called 'Manner-verbs' are known to exhibit the alternation. This alternation has two hallmarks: first, it is non-derivational. Hence, both alternates are morphologically unmarked. Second, the internal (instrument) argument of the transitive alternate is marked with a canonical

instrument preposition or an instrumental case. This proposal is strengthened by evidence from Hebrew and from Russian.

## 1 Introducing inanimate unergatives

### 1.1 The domain of intransitive verbs

This research explores the realm of intransitive verbs. First we must understand what syntactically characterizes intransitive verbs. What syntactic structures may express an intransitive predicate? Apparently, if there is only one argument (the subject of an intransitive verb), then it may be expected that there is a unique syntactic structure. However, research has shown that from a syntactic point of view, there are two classes of intransitives.

*The unaccusative hypothesis* (Perlmutter, 1978) is a hypothesis which claims that there are two classes of intransitive verbs: unaccusative verbs and unergative verbs, each class associated with a different underlying syntactic configuration. From a government and binding perspective, an unergative verb takes a D-structure subject and no object, whereas an unaccusative verb takes a D-Structure object and no subject. Alternatively, in argument structure terms, an unergative verb has an external argument but no direct internal argument, whereas an unaccusative verb has a direct internal argument but no external argument. Burzio (1986) found a correlation between the ability of a verb to take an external argument and its ability to assign case: unaccusatives (as well as passives) do not take an external argument and fail to assign accusative case; hence the internal argument moves to the canonical subject position to be assigned nominative Case.[1]

(1)     a) Unergative verb: [$_{IP}$NP [$_{VP}$ V]]

        b) Unaccusative verb : [$_{IP}$ NP$_i$ [$_{VP}$ V t$_i$]]

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[1] The VP-internal subject hypothesis has been ignored for the sake of simplicity.

Having established our entry point to the domain of intransitive verbs, let us have a closer look at their taxonomy from a thematic point of view, i.e. what thematic roles are typically associated with the subjects of the verbs.[2]

(2)    Unaccusatives

break, open, fall, freeze, melt, grow, develop, drown …

It seems that the subject of unaccusatives corresponds to a 'theme' or 'patient' role. From a Dowtian (Dowty, 1991) perspective, it stands for a role which typically designates an object which receives an action or is operated on.

(3)    Agent unergatives

walk, run, march, gallop, hurry, wander, dance …

The set of unergatives seems to consist of a variety of thematic roles. The most salient one is the subset of agent unergatives (3): their subject is the typical agent, namely, a conscious being carrying out some action.

(4)    Experiencer unergatives

worry, amuse, scare, surprise …

Uncommon in English, but productive in Hebrew and Dutch, the subject of the verbs exemplified in (4) denotes a conscious being which does not carry out some action, but rather experiences a mental state or emotion.

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[2] Differences between thematic roles do not necessarily lead to different syntactic mapping. It is even possible, from a mapping viewpoint, that distinctions between thematic roles per-se, are irrelevant.

(5)     **Inanimate unergatives (**also called theme unergatives):

glow, shine, beam, glare, glimmer, sparkle, bubble …

A group of verbs which has received little attention in the literature is the set of what was dubbed in the literature "theme unergatives" (exemplified in (5)). In order not to prejudge their thematic role, here I will refer to them by the neutral term *inanimate unergatives*. They are commonly analyzed as having a subject assigned a 'theme' or 'patient' role. This set of verbs poses interesting problems which are at the heart of the thesis.

*1.2 The domain of inanimate unergatives*

Inanimate unergatives fall into two main sub-classes, identified by Levin & Rappaport Hovav (Levin & Rappaport Hovav, 1995). The larger group is comprised of standardly named emission verbs:

(6)     Sound: burble, buzz, clang, crackle, jingle, ring, whistle…

Light: flash, flicker, gleam, glitter, shine, sparkle, twinkle…

Smell: reek, smell, stink…

Substance: bubble, gush, ooze, spew, spout, squirt…

The second, smaller sub-class refers to internally caused verbs of change of state:

(7)     bloom, blossom, flower, decay, flourish…

These two sub-classes provide an informal classification and do not necessarily reflect any formal properties. This list is by no means exhaustive and further examples will be provided later.

Before we turn to the challenges inanimate unergatives present, a few words are necessary regarding the manifestations of the unaccusative-unergative split. The split has been demonstrated repeatedly and cross-linguistically with a variety of syntactic diagnostics. The majority of these diagnostics identify an internal or external argument, classifying the corresponding verb as unaccusative (if an internal argument was detected) or unergative.

In Hebrew, there are two main internal argument diagnostics. i) <u>untriggered inversion:</u> if an untriggered inversion of a canonical subject to a post-verbal position (i.e., a VS order) is grammatical, the post-verbal argument is internal. ii) <u>possessive dative:</u> a dative constituent can serve as a possessor (in a loose sense) for the subject only if the subject is an internal argument.

First, let's see how these diagnostics work with unaccusatives. In Hebrew the verbs *nišbar* (break) and *nafal* (fall) are predicted to be unaccusatives by any argument realization theory. In what follows we will test if the syntactic evidence indeed supports the prediction.

(8)    a)    *nišberu šnei xalonot*  (Untriggered inversion)

                broke   two windows

                "Two windows broke"

        b)    *ha-ca'acu'a nišbar le-Dina*  (Possessive dative)

                The toy     broke to-Dina

                "Dina's toy broke"

        c)    *naflu harbe kadurim*

                Fell   many balls

                "Many balls fell"

        d)    *ha-kadur nafal le-yonatan*

                The-ball  fell to-Yonatan

                "Yonatan's ball fell"

Sentences (8a-d) are grammatical. According to the aforementioned diagnostics, thus, we observe that the verbs *nišbar* (break) and *nafal* (fall) contain an internal argument. That is, the prediction that they are unaccusatives is borne out.

In contrast, verbs that are predicted to be unergative, such as our inanimate unergatives, are expected to fail the untriggered inversion and possessive dative tests in Hebrew, according to the facts in (9).

(9)    a)    *cilcelu šnei telefonim/pa'amonim*  (Untriggered inversion)

        Rang    two phones   /bells

        "Two phones/bells rang"

    b)    *ha-telefon/ha-pa'amon cilcel le-Dina*[3]  (Possessive dative)

        The-phone/the-bell     rang to-Dina

        "Dina's phone/bell rang"

    c)    *he'iru harbe panasim*

        Shone   many flashlights

        "Many flashlights shone"

    d)    *ha-panas he'ir le-yonatan*

        The-flashlight shone to-Yonatan

        "Yonatan's flashlight shone"

    e)    *šarku mispar mašrokiyot*

        Whistled number whistles

        "A number of whistles blew"

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[3] In Hebrew, the same preposition, *le-* is usually used to represent "for" and "to". In this sentence, it is a possible interpretation that the bells ring/toll for Dina, but it is impossible to interpret Dina as the owner of the bells. The same applies to (9d,f,h,j).

f)   *ha-mašrokit šarka la-šoter*

   The-whistle   whistled to-the-cop

   "The cop's whistle blew"

g)   *hir'išu kama ra'ašanim*

   Rattled  some rattlers

   "Some rattles rattled"

h)   *ha-ra'ašan hir'iš la-yeled*

   The-rattle   rattled to-the-child

   "The child's rattle rattled"

i)   *šikšeku kama trisim*

   Jingled  some  blinds

   "Some blinds jingled"

j)   *ha-trisim šikšeku la-šaxen*

   The-blinds jingled  to-the-neighbor

   "The neighbor's blinds jingled"

The failure of the untriggered inversion (9a,c,e,g,i) and possessive dative (9b,d,f,h,j) tests indicate that, in Hebrew, these verbs are indeed unergatives. The same may be shown for the other members of the unergative family: agent and experiencer unergatives.

So far, we have pinpointed our domain of research. The class of inanimate unergatives presents us with two intriguing problems, which are introduced in the following sections: The mapping problem and the transitive alternate problem.

## *1.3 The mapping problem*

The area of linguistics called argument realization explores the study of the possible syntactic expressions of the arguments of a verb. One of the primary goals of a theory of argument realization is the isolation of the relevant components of meaning and the explication of their connection with the range of argument realization options. Therefore, any proper argument realization theory is required to explain, at least: i. **what** components of meaning are responsible for the different syntactic outcome. ii. **how** do these components of meaning generate this output.

One of the challenges in dealing with the argument realization of different intransitive verbs is to find a mapping algorithm that will correctly predict the syntactic split. That is, we need to find a series of steps for any intransitive predicate which will correctly predict its syntactic structure. A brief review of the different intransitive verbs (repeated below) will show that this task is not trivial:

(10)    Unaccusatives

break, open, fall, freeze, melt, grow, develop, drown …

(11)    Agent unergatives

walk, run, march, gallop, hurry, wander, dance …

(12)    Experiencer unergatives

worry, amuse, scare, surprise …

(13)    Inanimate unergatives (also called theme unergatives):

glow, shine, beam, glare, glimmer, sparkle, babble …

To demonstrate that there are no obvious solutions, let's try two simple strategies. The first one will be to assume that the unaccusative-unergative split is motivated thematically: If

all agent arguments were merged externally and all theme arguments were merged internally, it would suffice to predict the split (since the subject of unaccusatives corresponds to a theme role). However, this approach faces a serious problem since inanimate unergative (theme unergatives (13)) are merged externally, contrary the prediction. The question is then, if unaccusatives are thematically indistinguishable from inanimate unergatives, how the computational system distinguishes between (10) and (13).

The second approach will be to assume that the unaccusative-unergative split is motivated derivationally: There is strong evidence in favour of the view that unaccusatives are derived universally by a specific operation[4] from the corresponding transitive entry (Reinhart & Siloni, 2004). Assuming that unergatives are uniformly underived, the syntactic split appears to be accounted for. This approach, however, also encounters a problem: experiencer verbs (*worry,* etc.) seem to be derived by the same operation as the unaccusatives, yet they are unequivocally unergatives.[5] This means that the fact that a certain derivational process has occurred is not sufficient to predict the split.

One of my goals in this thesis is to find a mapping algorithm which will adequately predict the split. In the following sections we will investigate some mapping algorithms, understand their difficulties, realize why inanimate unergatives are a problem for mapping, and how my reanalysis of inanimate unergatives will solve the problem naturally.

## 1.4 The transitive alternate problem

One of the main goals of an argument realization theory is to delineate the ways different syntactic alternations of any predicate are related to each other and which operations generate these alternations. Are some alternations derived from a common/shared source

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[4] This operation is named reduction of the external role, or decausativization (see 2.2 later).
[5] See section 2.2 later for a strong morphological evidence from Hebrew.

from one of the alternates, or are they stored as independent items? What operations are possible? In what environments are these operations allowed?

Let us have a look on the evidence involving inanimate unergatives. L&R (1995) suggest that emission predicates (the significant subset of inanimate unergatives) do not have transitive alternates (1995:92):

(14)  a)      The jewels glittered/sparkled

              *The queen glittered/sparkled the jewels

      b)      The stream burbled/roared

              *The rocks burbled/roared the stream

      c)      The stew bubbled

              *The cook bubbled the stew

      d)      The truck rumbled

              *Peter rumbled the truck

      e)      The tea kettle whistled

              *The hot water whistled the kettle

But, as some have already noted (Frazee, 2005; Potashnik, 2006), and as is also noted in L&R (2005:11), a transitive alternate does appear for some of the usages:

(15)  a)      The tea-cups clattered

              I clattered the tea-cups (as I loaded the dishwasher)

      b)      The windows rattled

              The storm rattled the windows

c)    The doorbell buzzed/rang

The postman buzzed/rang the doorbell

d)    The flashlight beamed/shone

We beamed/shone the flashlight

The problem is, then, what are the relations between the transitive and the intransitive alternates? How are they formed? What process is responsible for this alternation?

An additional task of this thesis is to illuminate the relations between the transitive and intransitive alternates, without which no argument realization theory is complete. We will investigate some proposals regarding the relations between the alternates, understand their flaws and present evidence in Hebrew in favor of my hypothesis.

## 2 Theoretical Framework

In this study, I will adopt the framework of the θ-system (Reinhart, 2002), which belongs to the branch of causal theories. The θ-system therefore hypothesizes, like other causal theories, that causal information carried by the verb (partly) determines the syntactic outcome, namely, the syntactic realization of its arguments.

The θ-system is a theory of the interface between the conceptual system and the computational system. It consists of:

a.    .Lexical entries, which are coded concepts, with formal features defining the θ-relations of verb-entries (see 2.1).

b.    A set of arity operations on lexical entries (see 2.2). An arity operation is a valence-changing operation which generates a new entry from a former one.[6]

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[6] Arity operations assume a computational (active) lexicon. See Siloni 2002, Horvath and Siloni 2007.

c. Marking procedures (see 2.3), which 'prepare' a verb entry for syntactic derivations: assign an ACC (accusative) feature to the verb in the relevant cases, and determine merging properties of arguments (technically obtained by indices).

## 2.1 θ-system: semantic vocabulary

According to the θ-system, thematic roles are not primitives. Rather, they are a composition of a system of formal features. The features represent two principal facets of the meaning of a verb which are grammatically relevant, each represented by a binary feature:

a. [c] – **causes change**. /+c value (notation rules follow shortly) is associated with a participant interpreted as causing a change with respect to the denoted event.

b. [m] – **mental state relevant**. /+m value is associated with a participant whose mental state is relevant to the event. For instance, when an event requires volition or planning, a mental state is relevant to at least one of the arguments involved.

A given thematic role is interpreted as a composition of different values of the two features. It is also possible that a given feature is underspecified. Listed below are all the possible combinations:

Table 1: θ-clusters

| | | | |
|---|---|---|---|
| a) | [+c+m]- | | agent |
| b) | [+c-m] | - | inanimate cause / instrument |
| c) | [-c+m] | - | experiencer |
| d) | [-c-m] | - | theme / patient |
| e) | [+c] | - | cause |
| f) | [+m] | - | sentient |
| g) | [-m] | - | subject matter /locative source |
| h) | [-c] | - | goal / benefactor |
| i) | [ ] | - | arb(itrary) |

Notation:

[α]     =     Feature cluster α.
/α      =     Feature (and value) α. (e.g., the feature /+m occurs in the clusters [+c+m],
              [-c+m] and [+m])
[/α]    =     A cluster, one of whose features is /α. (e.g., [/-c] clusters are [-c+m], [-c-m]
              and [-c].)
[+]     =     A cluster, all of whose features have the value +. (e.g., [-] clusters are [-c-m],
              [-c], [-m].)

To understand the usage of the θ-clusters, consider the following examples.

(16)    V([+c +m], [-c –m])  - feed, eat, wash, shave…

        a)      John$_{[+c +m]}$ drank lemonade$_{[-c –m]}$
                **Agent**             **Theme**

        b)      *The straw$_{[+c -m]}$ drank lemonade$_{[-c –m]}$
                **Inanim. Cause**        **Theme**

We observe that (16a) is possible, but (16b) is ungrammatical, therefore the subject is compatible with agents only, reinforcing the analysis that the thematic role of the subject corresponds to a θ-cluster [+c +m]. This is in a contrast with the following set of verbs:

(17)    V([+c], [-c-m])  - break, open...

        a)      The wind$_{[+c -m]}$ /Max$_{[+c +m]}$ /The key$_{[+c -m]}$  opened the door$_{[-c –m]}$
                **Inanm. Cause Agent**          **Instrument**          **Theme**

        b)      The storm$_{[+c -m]}$ /Max$_{[+c +m]}$ /The stone$_{[+c -m]}$ broke the window$_{[-c –m]}$
                **Inanm. Cause   Agent**          **Instrument**          **Theme**

Here we realize that the subject argument allows both agents and inanimate causes (i.e. it is compatible with both [+c –m] and [+c +m] θ-clusters). Hence, it is reasonable to postulate that it is unspecified for the /m feature, and the verbs therefore are assumed to assign a [+c] role.

It is important to observe that the system does **not** treat thematic roles as primitives: formally, it considers only components of meaning. Thematic roles are labels which are a function of these components. Therefore, a θ-cluster may correspond to several thematic roles that share the same underlying components of meaning. For example, in (17) above, the θ-cluster [+c –m] has two thematic interpretations: it may be viewed as a force of nature, or as a man-made instrument designed to achieve a certain goal.

Furthermore, a θ-cluster need not necessarily correspond to a specific thematic role. The abstraction of separating the roles from the components of meaning is vital to the system. However, for the sake of convenience, I shall still use a vocabulary of thematic roles throughout this thesis, but it should be understood that I use it only as a cover term for reference to the relevant underlying components of meaning.

### 2.2 θ-system: operations on θ-grid

According to the framework of the θ-system, there are several operations that can apply to the verb's grid in the lexicon:[7] saturation, reduction, bundling and lexical causativization, to name a few.[8] For the purposes of this thesis, I will present only two of the relevant operations.

Reduction of an external [+c] role: Decausativization (Reinhart & Siloni, 2004). The [+c] external argument is eliminated, and the ACC feature (see. 2.3 later) of the verb is also reduced. The θ-grid valence is reduced by 1:

(18)    $V_{acc}$ ($\theta_{1[+c]}$, $\theta_2$) ---> V($\theta_2$)

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[7] A verb's grid is a specification of the verb that includes all its θ-clusters.
[8] It should be reminded that I take the lexicon to be a computational component. See Siloni 2002, Horvath & Siloni 2007.

For instance:

(19)  a)  <u>Open</u><sub>acc</sub> ([+c], [-c-m]) ---> <u>Open</u> ([-c-m])

The wind opened the door ---> the door opened.

b)  <u>Worry</u><sub>acc</sub> ([+c], [-c+m]) ---> <u>Worry</u> ([-c+m])

The situation worried Lucy ---> Lucy worried.

This is the operation which is assumed to derive unaccusatives; they are taken to be derived from their transitive alternates and not vice versa (contra Pesetsky 1995).

It seems that reduction (of the external role) cannot reduce agents [+c +m] (L&R 1995), as demonstrated in the following example.

(20)  a)  John drank lemonade.

b)  *Lemonade drank.

<u>Causativization:</u> this operation expands the verb's grid by 1 (adds an external argument). According to Reinhart (2002), Horvath & Siloni (2005, 2007) the relevant operation applies only in the lexicon (again, there are many different approaches, see Chierchia 1989, Pesetsky 1995, Pylkkänen 2002). (Syntactic causativization, which is also common across languages, is known to have very different properties).

(21)  a)  They ran / galloped /walked ----> She ran /galloped /walked them.

b)  They worked hard ---> She worked them hard.

It seems that causativization always adds an agent, not a cause [+c] (*agentivization*):

(22)  a)  The dog walked to his plate.

b)  Max/*The whip/*The hunger walked the dog to his plate.

In addition to the expansion of the θ-grid, *feature adjustment* also occurs: if the concept contained an agent before agentivization occurred, it is necessary to adjust its /+c feature to a /-c feature.[9] (several interesting issues and problems are associated with feature adjustment, but they are beyond the scope of this thesis, see Horvath & Siloni 2007). The result of a lexical causativization process is, for instance:

(23)  walk ([+c+m]) → CAUS-walk ([+c+m], [−c+m])

### 2.3 *θ-system: mapping procedures*

The mapping procedures by which the θ-system aims to account for the merging of arguments, including intransitives, are the following:

(24)  Lexicon marking

Given an n-place verb-entry, n>1,

a.  Mark a [-] cluster with index 2.

b.  Mark a [+] cluster with index 1.

c.  If the entry includes both a [+] cluster and a fully specified cluster [/α,/-c], mark the verb with the ACC (accusative) feature.

(25)  Relevant generalizations of lexical operations:

a.  Reduction applies to the marked entry (i.e., after marking).

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[9] Feature adjustment is necessary to prevent a situation where two [+c +m] clusters co-occur in the lexical entry. Such a situation would result in two external arguments (see mapping procedures, section 2.3).

b.      Reduction eliminates the accusative feature of the verb (fully or

partially).

(26)    CS merging instructions

a.      When nothing rules this out, merge externally.

b.      An argument realizing a cluster marked 2, merges internally; An

argument with a cluster marked 1, merges externally.


Let us look at the following example which demonstrates the operation of the

mapping procedures:


(27)    a)      The doctor$_{[+c]}$ worried Max$_{[-c+m]}$.
                **cause**                      **experiencer**

        b)      Max$_{[-c+m]}$  worried.
                **Experiencer**


Let us look closely at how the mapping procedures apply to the basic verb entry of

*worry*.


(28)    a)      Base entry:     worry ([+c], [-c+m]...)

        b)      Marking:        worry$_{(acc)}$ ([+c]$_1$, [-c+m]...)

        c)      Reduction:      worry ([-c+m])

        d)      Merge:          external (by (26a))


Let's examine the algorithm in each step. Assuming the base entry is V([+c], [-c –m]),

in step (28b) the verb is a 2-place predicate, hence it is applicable for marking. It contains a

[+c] cluster, which is a [+] cluster, thus marked with index 1. The verb also contains a [-c

+m] cluster, which is neither [+] nor [-] cluster, thus receiving no index. According to (24c), the verb is also marked with the ACC feature. This is the situation we are at in (27a): *The doctor worries Max*.

At the next step, (28c), reduction applies to the marked entry (by rule (25a)): it eliminates the external [+c] role and the ACC feature (by rule (25b)). We are left with the role of the experiencer, which is yet unmarked. By the default rule (26a), it merges externally.

Therefore, the algorithm predicts correctly that in (27a), *The doctor* is merged externally and *Max* internally while in (27b) *Max* is merged externally, after the reduction operation occurred (supported by morphological evidence in Hebrew, see Reinhart 2000). Another example:

(29)  a)  The wind$_{[+c]}$ opened the door$_{[-c-m]}$.
      **cause**                    **theme**

      b)  The door$_{[-c-m]}$ opened.
          **theme**

(30)  a)  Base entry for (29): e.g., <u>open</u>([+c], [-c-m])

      b)  Marking: <u>open</u>$_{acc}$ ([+c]$_1$, [-c-m]$_2$)

      c)  Reduction: <u>open</u> ([-c-m]$_2$)

      d)  Merge: Internal (by 26.b)

Assuming a V([+c], [-c-m]) verbal entry, it is applicable for marking. The [+c] cluster receives index 1 as in the previous example, whereas [-c-m] receives index 2. Additionally ACC feature is assigned to the verb. This is the state of affairs in (29a): *The wind opened the door.* Upon reduction, (30c), the [+c] cluster is eliminated and we are left with the theme role only, still marked 2 and eventually merged internally.

It can be observed that the system predicts correctly that the syntactic configuration of the verbs is quite different, although the same reduction operation occurred in (27b) and (29b).

Summarizing, the θ-system is an argument realization theory asserting that the composition of causal and mental state information, along with a set of lexical operations, fully determine the possible syntactic structures of any lexical entry.

The θ-system is well within a lexicalist approach, namely, asserts that the mental lexicon is an active component of grammar and includes rule governed derivational relations between entries. This is in contrast with non-lexicalist approaches (Marantz 1997) that view the mental lexicon as non-computational lists of lexical items that feed the computational syntactic component, and have no derivational relations between its items.

Among causal theories, the θ-system argues for a feature-based approach, contra Levin and Rappaport 1995 (L&R) who assert that the relevant generalizations can only be stated in terms of world knowledge and properties of events. As I show in section 3.1, the challenge inanimate unergatives present cannot be accounted for in terms of world knowledge. Rather, it seems that linguistic coding of concepts (and not knowledge of events) is at work here. Hence, the θ-system is particularly suitable for our purposes and receives support from this empirical domain.

## 3 The mapping problem

As mentioned in section 1.3, the first problem we are concerned with, with regard to inanimate (theme) unergatives, is related to the merging of their subject. What dictates its external merging?

Let's return to the mapping problem. The unaccusative hypothesis (Perlmutter, 1978) divides the intransitive verbs into two separate sets: unaccusative verbs, whose subject

merges internally, and unergatives, whose subject merges externally. These two sets are different in their syntactic structure. Now re-consider the following sets of verbs ((10)-(13) repeated):

(31) Unaccusatives

break, open, fall, freeze, melt, grow, develop, drown …

(32) Agent unergatives

walk, run, march, gallop, hurry, wander, dance …

(33) Inanimate unergatives (also called theme unergatives):

glow, shine, beam, glare, glimmer, sparkle, babble …

The problem is, on what basis does the computational system merge set (31) in one way while sets (32) and (33) in another way. As mentioned in section 1.3, if we treat inanimate unergatives as thematically indistinct from unaccusatives, the decision cannot be done on a purely thematic basis; therefore some other mechanism must be added.

Before turning to the solution I am about to propose, I shall briefly review two solutions previously suggested in the linguistic literature and discuss how they approach the problem and what their flaws are.

## *3.1 Previous accounts*

### 3.1.1 Inanimate unergatives are internally caused (L&R 1995)

Levin & Rappaport (1995) argue that inanimate unergatives are *internally caused:*[10] *"some property inherent to the argument of the verb is 'responsible' for bringing about the*

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[10] Levin & Rappaport Hovav's causation concept should not be conflated with /+c value in the θ-system. While the former is interpreted as bringing about an eventuality, a /+c value asserts that the argument modifies the

*eventuality"* (1995:91). For example, in *the diamond glowed*, the diamond has the physical property such that the eventuality of glowing occurs. Additionally, their argument realization theory provides the Immediate Cause Linking Rule: "The argument of a verb that denotes the immediate cause of the eventuality described by that verb is its external argument" (1995:135). Hence, combining the Immediate Cause Linking Rule with the assumption that the arguments of inanimate unergatives are *internal cause*, it follows that the arguments of inanimate unergatives are externally mapped.[11]

However, as Reinhart (2002) remarks, internal causation does not distinguish inanimate unergatives from some unaccusatives. For instance, in *the glass broke*, the glass has some property inherent to the argument of the verb – the fragility - which is required in order to bring about the eventuality of breaking. Therefore, Levin & Rappaport's theory would predict that this argument would be mapped externally, contrary to fact. Hence, 'internal causation' is not formalized in the θ-system.

In further reinforcement of Reinhart's criticism, note that since the causation concept of L&R makes direct reference to the existential status of the eventuality or the state of affairs ("bringing about" of the event), any argument may be viewed as contributing to the existence of the eventuality: it has the inherent property of being able to participate in the event denoted by the predicate. If it had lacked this property, the eventuality could not have occurred: the fragility of a glass is required to bring about the eventuality of breaking; the edibility of an apple is required to bring about the eventuality of eating an apple; the readability of a book is required to bring about the eventuality of reading a book, etc.

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actual world in a certain way; it does not assert whether the argument has the ability to enable the relevant state of affairs (though, in many situations, it is implied). For instance, in *The baby ate the soup*, *The baby* has a /+c value, having modified the actual world, but it does not necessarily follow that *the baby* had the capacity to bring about the state of affairs where it was eating a soup.

[11] On a par, the subject of unaccusatives according to L&R is not interpreted as cause, either internal or external, and their subject merges internally according to a different rule.

So, it seems that the internal causation definition of L&R does not solve the problem as it allows the inclusion of unaccusatives. The question, then, using the terminology of Levin and Rappaport, is why the subjects of inanimate unergatives are conceptualized as bringing about an eventuality, while the subjects of unaccusatives are not.[12]

### 3.1.2 Inanimate unergatives are base-generated as intransitives, unaccusatives are derived (Reinhart 2002)

Reinhart (2002) proposes that the set of inanimate unergatives and the set of unaccusatives are thematically indistinguishable. The subject of the verb in both has the θ-cluster of a theme role: [-c −m]. Therefore, in order to predict the different merging results, Reinhart suggests that inanimate unergatives (also called "theme unergatives" in θ-system terminology) are base-generated as intransitives, and hence they fail to undergo marking. As a result, their [-c −m] cluster is merged externally by (26.a).This is demonstrated in the following example:

(34)   a)     The diamond glowed

(35)   a)     Base entry for (34): e.g., glow([-c-m])

        b)     Marking:  inapplicable (one place entry)

        c)     Merge: external (by 26.a) – "When nothing rules this out, merge externally".

Unaccusatives, however, are derived universally from their transitive alternates by a reduction of the external role. Therefore, their theme role is marked for internal merging before reduction occurs ((29) repeated):

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[12]L&R bring the "by itself" diagnostic to support the claim that the conceptualization of the two sets is different. However, as shown in section 3.2, their diagnostic is untenable.

(36) a) The wind$_{[+c]}$ opened the door$_{[-c-m]}$.
   **cause**                 **theme**

   b) The door$_{[-c-m]}$ opened.
   **theme**

(37) a) Base entry for (36): e.g., <u>open</u>([+c], [-c-m])

   b) Marking: <u>open</u>$_{acc}$ ([+c]$_1$, [-c-m]$_2$)

   c) Reduction: <u>open</u> ([-c-m]$_2$)

   d) Merge: Internal (by 14.b)

It can be observed that the θ-system has a constraint that makes a direct reference to the arity of a lexical entry: the marking does not apply to one-place entries. Recall that the marking procedures are preceded by a constraint which determines the scope of their application: "Given an n-place verb-entry, n>1". The constraint is in its nature non-semantic, in a system that classifies arguments by their semantics (their grammatically relevant components of meanings). Thus the θ-system does propose an acceptable way to account for the fact that inanimate unergatives are merged differently from unaccusatives. However, that constraint on the arity of the verb seems like an ad hoc addition whose sole purpose is to block 'theme' unergatives from being merged internally.[13] It may seem a bit odd that a functional system will have a built-in mechanism, whose only purpose is to generate exclusions from the marking process, which actually affects but a specific set of verbs. Not only this, but evidently this exclusion is done on non-semantic/thematic grounds, contrary to the whole character of the system.

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[13] As I show in detail in section 3.3, the "n>1" constraint affects only 'theme' unergatives and does not interfere with any other possible merging results.

To conclude, we have seen that both previous accounts for the mapping of the subject of inanimate unergatives are problematic. I now turn to propose my solution to this problem.

### *3.2 Main hypothesis: the subject of inanimate unergatives is an inanimate cause [+c −m]*

### 3.2.1 The main hypothesis

It should be noted that, in a matter of fact, no specific evidence was ever brought to support the claim that the subject of inanimate unergative verbs receives a theme role. The inclination to classify the subjects of both unaccusatives and inanimate unergatives as themes may stem from the fact that we tend to find the same DPs in the subject position of both sets: inanimate entities like diamonds, rocks, bells, garbage, etc. This inclination, however, may be proved to be wrong, since it is the verb that determines the semantics of its arguments and hence the same DP may receive two different θ-clusters from two different verbs. Stated differently, properties of DPs that typically fill certain thematic roles are often confused with properties of the thematic roles themselves.

It is then possible that inanimate unergatives have a different θ-cluster, and hence are thematically distinguishable from unaccusatives. Let me suggest the following hypothesis:

(38) Main hypothesis: the subject of inanimate unergatives receives a [+c −m][14] cluster, the inanimate cause role.

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[14] /-m value means that mental state of the participant is irrelevant for the event. A /+m value implies animacy, but animacy does not necessarily imply /+m value. Yet, we observe that in the inanimate unergatives set all arguments appear to be strictly inanimate. That is, it is possible that the mental state is relevant (by forcing lack of animacy). A more detailed investigation of the /m semantics in the θ-system is beyond the scope of this work, which principally investigates /+c values; I shall adhere to assuming a [/-m] cluster for inanimate unergatives.

The main hypothesis asserts that the subject of inanimate unergatives has a causal implication. To begin with, I claim that this hypothesis is as good as the hypothesis which maintains that the relevant subject is a [-c –m], a theme role.

Before we turn to the implications of the main hypothesis, namely to the way it solves the mapping problem elegantly, we look for evidence that support it. That is, we look for diagnostics that identify /+c in a verb, or alternatively, diagnostics that identify /-c in a verb. In what follows, I will present several tests that presumably detect cause or its absence, show them to be untenable for our purposes. Then, I will proceed to suggest a test of my own.

An alleged test to detect cause is the addition of a "by itself" phrase (Levin & Rappaport, 1995). Based on examples such as (39), L&R argue that if "by itself" is acceptable, then there is an external (but not internal) cause in the concept, and if "by itself" is not acceptable, then there is no external cause in the concept, as seen below:

(39)   a)   The door broke by itself          (unaccusatives)

       b)   *The diamond glowed by itself     (inanimate unergative)

However, the addition of a "by itself" phrase is not always compatible with an external cause:

(40)   a)   *The wind blew the leaf by itself

       b)   *The food was eaten by itself

       c)   *The knife peeled the apple by itself

It seems then that this diagnostic can detect only /+c which is **not** present in the syntax/semantics, i.e., it can only be used for roles present only in the verbal concept.

Therefore, the "by itself" diagnostic is inapplicable for our purposes, since if inanimate unergatives have the cluster [+c –m], the cause role is present not only in the concept. Rather, it is realized syntactically by the external argument. Alternatively, if inanimate unergatives possess the cluster [-c –m], then "by itself" would fail as well, since in this case there is no cause present either.

Another test proposed to detect a /+c role is the "did it" test (Frazee, 2005) for detecting a cause present in the verbal concept but not in the syntax:

(41)  a)      The glass broke. Bill did it

      b)      The door opened. Mary did it

*Break* and *open* are unaccusatives. The grammaticality of (41) according to Frazee means that there is a cause role present in the concept which caused the breakage/opening. However, this diagnostic seems to suffer from the same weaknesses as the "by itself" diagnostics:

(42)  a)      *The knife peeled the apple. John did it.

      b)      *Nira was worked hard. Ruti did it. (= Ruti forced Nira to work).

      c)      ?The ice melted. Bill did it.

In (42) sentences we all have semantically a clear cause (present in the verbal concept but not in syntax), yet, the ungrammaticality of (42) shows "did it" test is untenable. We still need a test that can distinguish between +c and –c.

**3.2.2 The "Caused-NP" experiment**

So far we have observed that there were no reliable diagnostics to identify the θ-system value of /c. Let me propose, therefore, a test that may reveal that value for intransitive verbs: for each sentence, one adds a second sentence, rephrasing the original one so that the causation is expressed periphrastically, using a nominalization of the verb. If the result is acceptable, the subject is compatible with a /+c interpretation, otherwise, it is not compatible with a /+c interpretation, i.e., has a /-c value.

For instance, consider the following examples:

(43)   (a)    The window broke

                *The window caused the breakage

       (b)    The ball fell

                *The ball caused the fall

       (c)    The ice melted

                *The ice caused the melting

       (d)    The glasses disappeared

                *The glasses caused the disappearance

       (e)    The door closed

                *The door caused the close

(44)   (a)    The garbage smelled

                The garbage caused the smell

       (b)    The bell rang

                The bell caused the ringing

       (c)    The flashlight shone

                The flashlight caused the shine

(d)    The stream gushed

The stream caused the gush

(e)    The firewood crackled

The firewood caused the crackle

We observe here that the unaccusatives *break, fall, melt, disappear* and *close* fail the test, namely, the corresponding paraphrase with an explicit cause predicate and a nominalization is ungrammatical. In contrast, the unergatives *smell, ring, shine, gush* and *crackle* pass it, giving rise to an acceptable paraphrase. Thus, the θ-role of unaccusatives must include a /-c value, while that of inanimate unergatives is compatible with a /+c interpretation.

One may wonder whether the diagnostic identifies only the θ-system /c value, and does not identify other components of meanings. Causation often carries multiple meanings: it may be interpreted as either affecting a change in the world itself (Reinhart 2002), or as having an existential effect of bringing about a certain state of affairs or an event (L&R 1995).

It appears nonetheless that when one deals with verbs having animate subjects, the existential status of the event, as suggested by L&R's interpretation of causation, must be considered (alongside the cause of a change in the world), because animate arguments usually have the capacity and the volition to bring about eventualities. Thus, when the subject is animate, even some explicit cause paraphrases of sentences that employ unaccusatives may be marginally acceptable:

(45)    (a)    The man escaped

?The man caused the escape

  (b)  The girl fell

      ?The girl caused the fall

  (c)  John disappeared

      ?John caused the disappearance

Compare (43d) with (45c): it is clear that both John and the glasses have the same thematic role and yet we are more inclined to accept the "caused-NP" test for John. That is, there is a good reason to suspect that animacy triggers an additional set of implications which may influence what meaning of **cause** is evaluated in the test. However, the test is suited for our purpose since the class of verbs we are concerned with all select inanimate subjects; the complication of an additional meaning of **cause** (bringing about an eventuality) therefore does not arise here.

### 3.2.3 Method and procedures

In order to test speakers' intuition with regard to the "caused-NP" test, I have designed an experiment. The participants were 50 first year students, naïve adult native speakers of Hebrew (volunteers). The experiment was conducted in a quiet classroom. A printed identical questionnaire was given to each participant, which they filled simultaneously. The questionnaire contained 40 pairs of sentences as formulated above, namely, the second sentence in each pair was a rephrase of the first one so that the causation was expressed periphrastically, using a nominalization of the verb. The participants also received printed instructions to mark "Yes" if they found the second sentence in each pair to be grammatical, or "No" if they rejected its grammaticality (see Appendix A for the actual questionnaire). The duration of the test was 20 minutes. There was no feedback and no questions were raised.

85% (34 out of 40) of the verbs appearing in the first sentence of each pair were intransitive, while the rest 15% (6 out of 40) were transitives. 53% (18 out of 34) of the

intransitive verbs were unaccusatives and 47% were unergatives. The sentences appeared in a random order.

### 3.2.4 Results

The intransitive verbs with inanimate subjects (85% of the intransitives, 29 out of 34) were divided into three classes: one class of unaccusatives (such as *ne'elam* 'disappear', *niš*bar 'break', *hitkalkel* 'break down', *hitmale* 'fill'), and two classes of inanimate unergatives: emission verbs (such as š*arak* 'whistle', *hicxin* 'stink', *hivzik* 'flash', *tirter* 'rumble', *cilcel* 'ring', *karan* 'radiate', š*a'ag* 'roar') and internal change of state verbs (such as *parax* 'flower', *livlev* 'blossom', *hirkiv* 'rot').

Each verb was assigned a "Causativity Level" value. This value is the percent of examinees who accepted the causal implication of the rephrased sentence. The experiment, then, tested the effects of the independent variable Verb Class on the dependant variable Causativity Level. Below are the results of the sentences containing inanimate subjects only (for the full results, see Appendix A.2).

Table 2: Results of "caused-NP" test
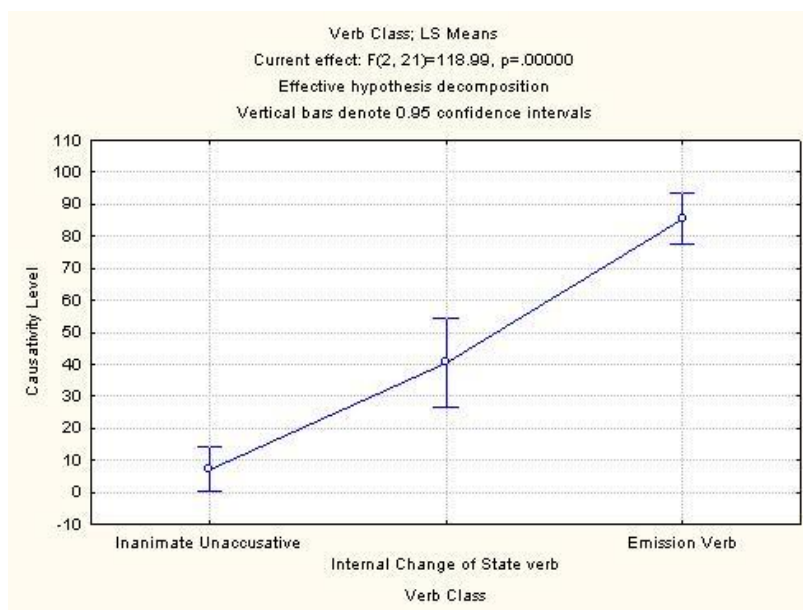
A one way Between-Items ANOVA test revealed a Main effect for Verb Class $F(2,21)=118.99$ $p<0.00001$. The average value of the Causativity Level variable of inanimate unaccusatives was significantly lower than that of the emission verbs. Internal change of state verbs (*flower, blossom, rot*) are empirically found to be half-way between unaccusatives and emission verbs with regard to their causativity level.

To establish which classes are taken to be significantly more causative than others, a post hoc Tukey test was conducted. The results revealed a significant difference between inanimate unaccusatives and emission verbs ($p<0.001$), which are the larger group of inanimate unergatives. The internal change of state verbs also showed a statistically significant difference with respect to unaccusatives ($p < 0.01$), although lower than the results of emission verbs.[15]

### 3.2.5 Discussion

The data demonstrates that there is a clear correlation between the acceptance of the causal implication and the distinction between unaccusative and unergative verbs. The subject of unergative intransitives is perceived as a cause,[16] while that of unaccusative ones is not. This strengthens the claim that the alleged 'theme' unergatives, unlike unaccusatives, do carry a causal implication and hence should have a different /c value; they are thematically distinguishable from unaccusatives. The hypothesis in (38), that the external role of inanimate unergatives is [+c-m], rather than [-c-m], thus receives strong support.

It is interesting to observe that unlike the subjects of emission verbs which were all comprehended as cause, the subjects of internal change of state verbs like *blossom, flower,*

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[15] We discuss the behavior of internal change of state verbs immediately, see section 3.2.5.

[16] Potentially, the subject of unergatives is compatible with cause interpretation, so it could also be unspecified for /c, i.e. a [-m] cluster. This analysis **also** would be able to divide unergatives and unaccusatives into two distinct sets. However, for consistency with current θ-system marking procedures, I will opt for an analysis of the inanimate unergative subject as a [+c −m] θ-cluster.

*rot* were neither entirely perceived as cause or non-cause. Perhaps it is a part of the reason why some researches classify them as unaccusatives (Alexiadou, 2005), whereas others as unergatives (Reinhart, 2002). This observation remains an interesting subject for further research.

Another interesting question is raised by transitive verbs – do their arguments have causal implications? In the current experiment, subjects or direct objects of transitives verbs were not tested. However, I did test the causal implication of instruments with some transitive verbs, for instance, the instrument *fire* in the sentence *ronen saraf et ha-bayit be-eš* 'Ronen burned the house down by fire'. The causativity level for instruments in transitive verbs was 68% - less than the level of emission verbs, though most examinees accepted a causal implication for them. The lower degree of causativity for instruments, in my opinion, is caused by a tendency to associate a causal implication to the sentence's subject only: the subject's /+c 'over-shadows' the instrument's /+c to some extent.

I have now shown that there is a good reason to believe that inanimate unergatives do have a causal implication, and therefore have a θ-cluster [+c −m], sharply contrasting with unaccusatives, with an excellent significance for emission verbs and with less significance for internal change of state verbs.

### 3.3 Accounting for the mapping problem

When considering the domain of intransitive verbs, one observes a clear-cut formal split between unaccusatives and unergatives; the following simple generalization is exhibited:

Table 3: Intransitive verbs merging

| | | | |
|---|---|---|---|
| a) | [+c+m]- | externally | (agent unergatives*: run, march…*) |
| b) | [+c-m] - | externally | (inanimate unergatives: *glow, shine…*) |
| c) | [-c+m] - | externally | (experiencer unergatives: *worry, scare...*) |
| d) | [-] - | internally | (unaccusatives: *break, open…*) |

The unaccusative hypothesis proposes that there are two types of intransitives. To distinguish between the two types, one minimally needs a single binary value/feature. If the inanimate unergatives turn out to have the cluster [+c −m], then this single value is readily available for intransitives: [-] clusters are merged internally. Everything that is not a [-] cluster is not merged internally. Thus we come to a very simple and learnable rule:

(46)  **The intransitive verb classification rule**: an unaccusative verb has only [-] cluster(s). An unergative verb has only a non [-] cluster.

To put it simply, the distinct mapping can thus be done on a purely thematic basis, without resorting to the dubious "internal causation" concept, or the number of θ-roles the verb has.

Another important result is a simplification of the θ-system, and in particular, of the marking procedures:

(47)  Lexicon marking (Repeated)

Given an n-place verb-entry, n>1,

a.      Mark a [-] cluster with index 2.

b.      Mark a [+] cluster with index 1.

c.      If the entry includes both a [+] cluster and a fully specified cluster [/α,/-c], mark the verb with the ACC feature.

(48)  CS merging instructions (Repeated)

a.      When nothing rules this out, merge externally.

b.      An argument realizing a cluster marked 2 merges internally; an argument with a cluster marked 1, merges externally.

One could easily see that the only effect of the rule: "Given an n-place verb-entry, n>1" is to block 'theme' unergatives from being merged internally. The deletion of this rule would not affect verbs with clusters which are unmarked or marked with index 1: these are anyhow merged externally (either by clause (48a) or by clause (48b)). The rule affects the merging outcome only for a 1-place verb whose cluster is marked with index 2: 'theme' unergatives. This is so because given this "n>1" extra clause, these verbs are not marked at all, and therefore are mapped externally. Without it, these verbs would have been marked with index 2 (under the assumption that their θ-role is 'theme'), and accordingly mapped internally.

But now, if there is no such thing as 'theme' unergatives, the rule is no longer required. Themes are always merged internally. Inanimate unergatives have a [+c-m] role, and are therefore not marked with an index in the lexicon, and accordingly, their subjects are mapped externally.

I believe this is a welcome result for two central reasons. First, there are no gaps in the paradigm: it is simpler and more general. Secondly, the arity of a verb does not play a role in merging whereas the actual thematic content of any argument does, regardless of its appearance in a 1-place, a 2-place or a 3-place verb.[17] A non-semantic constraint was removed from a system that classifies verb entries according to their grammatically relevant semantic aspects.

## 4 The transitive alternate problem

Now we come to address the second problem raised by inanimate unergatives. L&R (1995) suggest that emission predicates do not have transitive alternates (1995:92).

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[17] I have not intended to say that the merging of DPs which fill any thematic role is **absolute**, since [+c −m] or [-c +m] clusters may be merged either internally or externally. The system has a mechanism which allows variable merging results, but it should be stressed that this mechanism relies on **the thematic contents** of the verb's grid and does not make reference to arity. The fact that the verb has arity n=3 does not alter the merging results.

(49)  a)  The jewels glittered/sparkled.

*The queen glittered/sparkled the jewels

b)  The stream burbled/roared

*The rocks burbled/roared the stream

c)  The stew bubbled

*The cook bubbled the stew

d)  The truck rumbled

*Peter rumbled the truck

e)  The tea kettle whistled

*The hot water whistled the kettle

But, as some have already noted (Frazee, 2005; Potashnik, 2006), and as is also noted in L&R (2005:11), a transitive alternate does appear for some of the usages:

(50)  a)  The tea-cups clattered

I clattered the tea-cups (as I loaded the dishwasher)

b)  The windows rattled

The storm rattled the windows

c)  The doorbell buzzed/rang

The postman buzzed/rang the doorbell

d)  The flashlight beamed/shone

We beamed/shone the flashlight

The problem is, then, what are the relations between the transitive and the intransitive alternates? How are they formed? What process is responsible for this alternation? An argument realization theory must account for the witnessed possible syntactic manifestations. Before turning to my solution, I shall once again review briefly Levin & Rappaport and Reinhart's solutions to the problem.

## *4.1 Previous accounts*

### 4.1.1 Unrelated, underived verb meanings (L&R 1995)

The alternation exhibited in (50a-d) is explained by L&R (1995) in the following way: *"these pairs are what we call spurious causative pairs: by spurious we mean that what appears to be a causative pair involves two distinct verb meanings - one of them causative – that are not derivationally related"*. (1995:115).

L&R claim then, that the intransitive and transitive alternates are two completely separate, unrelated verbs with different meanings. But does the claim that they are not derivationally related necessarily mean that the alternates stand for two different meanings? It does seem that the transitive and the intransitive alternates are semantically related. The meaning of the verb has not been shifted or altered; it does not depict a different or unrelated eventuality, as can be seen in the following entailment: *the postman buzzed the doorbell* → *the doorbell buzzed*. Therefore, despite the fact that the mechanisms proposed in the argument realization theory of L&R are based on operations which generate different syntactic realizations, they choose to make a special and inadequate exception in order to account for the inanimate unergatives' witnessed alternation in (50).

### 4.1.2 The transitive alternate is formed by causativization (Reinhart 2002)

Reinhart maintains that in pairs such as those in (50), the transitive alternate is derived from the intransitive alternate by a causativization process: the verb's grid is expanded by 1,

and a new agent is added to the entry. According to Reinhart's assumption that the external θ-role of inanimate unergatives is a theme role [-c –m], the original intransitive subject is expected to be realized as the direct object of the derived causative verb, since this verb is marked with the ACC feature:[18] ((24c): "*If the entry includes both a [+] cluster and a fully specified cluster [/α,/-c], mark the verb with the ACC feature*)".

However, there is some interesting counter evidence to the claim that the derived verb has accusative Case, which undermines the hypothesis that the transitive alternate is derived from the intransitive one as suggested by Reinhart. Let us have a look at how some transitive alternates of inanimate unergatives are realized in Hebrew (for additional cross-linguistic data, see Appendix B):

(51)  a)  *danny cilcel **be-**pa'amon ha-delet*

Danny rang  in-bell       the-door

"Danny rang the doorbell"

b)  *galit he'ira **ba-**panas*

Galit shone in-the-flashlight

"Galit shone the flashlight"

c)  *ha-šoter šarak      **ba-**mašrokit*

The-cop  whistled in-the-whistle

"The cop blew the whistle"

d)  *ha-tinok hir'iš    **ba-**ra'ašan*

The-baby rattled in-the-rattler

"The baby rattled the rattle"

---

[18] Even if the subject θ-cluster is a [+c –m] role and not a [-c –m] role, causativization is still expected to exhibit feature adjustment – that is, the /+c value of that role is adjusted to a /-c role and the entry is marked with ACC feature, see Horvath and Siloni 2007 (and in particular 2007:32).

e) *ha-yeled šikšek* **ba**-*trisim*

The-child jingled in-the-blinds

"The child jingled-CAUS the blinds"

(52) a) *pa'amon ha-delet cilcel*

Bell      the-door rang

"The doorbell rang"

b) *ha**-**panas he'ir*

The-flashlight shone

"The flashlight shone"

c) *ha-mašrokit šarka*

The-whistle whistled

"The whistle blew"

d) *ha-ra'ašan hir'iš*

The-rattle    rattled

"The rattle rattled"

e) *ha-trisim šikšeku*

The-blinds jingled

"The blinds jingled"


The causativization process is therefore unlikely to be involved in the derivation, since if causativization occurs, the verb is expected to be marked with ACC feature (either by direct [/-c] role of the original intransitive subject or by feature adjustment). Here, the original intransitive subject is realized with a preposition.

Another important fact which undermines the causativization analysis is that there is no morphological marking on the transitive verb. Causativization is always marked morphologically in Hebrew:

(53) a)    *eli **rakad***

eli danced

"Eli danced"

b)    *ha-xayalim **ca'adu***

the soldiers marched

"The soldiers marched"

(54) a)    *mira **hirkida** et eli*

mira dance-CAUS eli

"Mira made Eli dance"

b)    *ha-mefaked **hic'id** et ha-xayalim*

the commander march-CAUS the soldiers

"The commander made the soldiers march"

This is in contrast to the evidence in (50). There, both transitive and intransitive verbs are morphologically identical and unmarked.

I conclude therefore, that it is unlikely that causativization is responsible for the alternation. What process then may account for the witnessed data? In order to answer this question, let us examine briefly another pattern of argument realization, that of Agent-Instrument.

## *4.2 The solution of the transitive alternate problem: the Agent-Instrument pattern[19]*

According to Reinhart (2002), an instrument role ([+c −m]) is generally licensed by an agent role, and need not be listed specifically in each verb's theta-grid. This means that the instrument role can always be realized (when licensed) optionally, but is not directly selected by the verb. Furthermore, it seems that the instrument role follows certain constraints on its syntactic distribution:

(55)    Instrument Generalization (Siloni, 2002)

In order to be realized syntactically, an instrument requires the presence of either an explicit agent or an implicit argument interpretable as an agent.

However, there is a sub-set of agentive verbs such as *drill* or *peel* whose behavior with regard to the instrument argument is different. What defines this set is that the verbs in it include reference to a specific instrument. Specifically, the event denoted by the verb can not take place without that instrument (for example, it is impossible to drill without a drill). In interpretative terms of causality, this means that the verb is associated with a set of two conditions which together are sufficient in order to bring it about – the agent and the instrument; it selects two [/+c] roles. Note however, that only one of these roles is obligatorily realized:

(56)    a)    Max peeled the apple (with the knife)

    b)    The knife peeled the apple

drill/peel ([+c+m], [-c-m],  [+c-m])

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[19] Originally called "Manner-Verbs" (Reinhart 2002:244)

How do the mapping procedures predict the merging of *the knife* in (56b)?

(57)    a)    Basic entry:    peel ([+c+m], [-c-m], [+c-m])

b)    Marking:    peel$_{acc}$ ([+c+m]$_1$, [-c-m]$_2$, [+c-m])

c)    Agent not realized:[20]    peel$_{acc}$ ([+c-m], [-c-m]$_2$)

d)    Merge of the instrument argument: external (by (26a): "When nothing rules this out, merge externally"

Let us observe the following facts regarding this pattern:

(i) The pattern has two hallmarks: a) both alternates are morphologically unmarked since a derivational process was not involved (see ii below). b) The instrument argument, when not in the subject position, is marked with a canonical instrumental preposition or an instrumental case.

(ii) The Agent-Instrument pattern is a source of non-derivational alternation in the θ-system. Other alternations are derived by various arity operations such as reduction, saturation and lexical causativization. The Agent-Instrument pattern is not derived by an arity operation.[21]

(iii) Nothing in the θ-system precludes the possibility of having a two-place variant of the Agent-Instrument pattern. There is no reason we should not encounter a thematic grid such as V([+c+m], [+c-m]). Such a grid is expected to have an unergative alternate. Furthermore, nothing prevents such a theoretical unergative alternate from undergoing lexical

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[20] Note that it is not common to have agent arguments not realized. This is a property which seems to be unique to the Agent-Instrument pattern.

[21] Stipulating an unknown, new derivational (valence-changing) operation which reduces agents only ([+c +m]) in a very specific set of verbs is possible, though implausible because that new operation leaves no morphological traces in Hebrew and Russian. Both languages regularly mark the verb morphologically when derivational operations occur. Such a stipulation in this stage would create a new class of derivational operations which behaves strikingly different from what we know about derivational operations so far. It is more economic to assume that the Agent-Instrument pattern is a different phenomenon.

causativization, resulting in two transitive alternates for a single unergative. As I immediately show in section 4.4, Hebrew presents us with evidence for such verbs.[22]

(iv) The label "instrument" given to a [+c −m] cluster reflects only one of its possible thematic interpretations. We already noted that the θ-system makes reference to components of meanings; thematic roles are only labels. In our case, instruments and inanimate causes share the same cluster composition. Reinhart (2002) also stresses this claim: *"The cluster [+c-m] is consistent with both the instrument and the cause role. In both cases, the bearer of the role causes a change, and no mental state is involved. The difference is that an instrument never does it alone, but in association with an agent. There is, however, no reason to assume additional features for capturing this difference"* (p. 233). Therefore, importantly, the generalization formulated in the Agent-Instrument pattern is expected to be exhibited also in verbs with inanimate cause arguments and not necessarily only in verbs with man-made instrument arguments.

Reformulating, one observes in Reinhart's account two orthogonal conditions which are required of a verb with an inanimate argument in order to participate in the Agent-Instrument pattern:

(58)    The conditions required to exhibit the Agent-Instrument pattern:

i) An agent is available in the concept.

ii) There is an inanimate argument with a /+c value.[23]

---

[22] For instance (repeated immediately in section 4.4):
*eyal* **tas** *ba-matos* 'Eyal flew in the airplane' – a transitive verb with a grid of V([+c +m], [+c −m]).
*ha-matos* **tas** 'The airplane flew' – an unergative intransitive verb with a grid of V([+c −m]).
*ha-kapten* **hetis** *et ha-matos* ''the captain flew the plane') –a transitive verb with a grid of V([+c +m], [-c −m]) having a marked causative morphology.
[23](60ii) refers only to inanimate arguments that are **selected** by the verb, not any instrument licensed by the instrument generalization (55). For instance: *the boy ate the soup with a spoon,* but not *\*the spoon ate the soup*.

Each of the conditions by itself is necessary but not sufficient. Condition i) is responsible for the existence of an alternation with an agent argument merged externally. Condition ii) is responsible for the interpretation of the inanimate argument as an instrument (or inanimate cause) role and not as a theme role. Recall that although a theme role and an instrument role are similar in the sense they are usually objects which may be operated on (specifically or generally) by agents, the latter role involves a causal interpretation absent in the former.

One can also easily see that the conditions are independent of each other: the fact that some inanimate argument may be interpreted as having a causal implication does not necessarily have any bearing on whether it may or may not be used as an instrument. Also, it is worthwhile noting that a theme role is not mentioned anywhere in the generalization: it is not a part of the requirements – it is simply easier to identify the role of an instrument/inanimate cause if a separate argument realizing the distinct theme role is also present.

In the light of the above and given my hypothesis that the subject of inanimate unergatives involves a [+c −m] cluster, the inanimate cause, or the instrument role, it is fully expected that the Agent-Instrument pattern will be attested by inanimate unergatives, as indicated by the evidence from Hebrew.

First, consider an example of the Agent-Instrument pattern in Hebrew:

(59)　a)　*danny kilef et ha-tapuax **be**-sakin*

　　　　　Danny peeled the-apple in-knife

　　　　　"Danny peeled the apple with a knife"

　　b)　*Ha-sakin kilfa et ha-tapuax*

　　　　　The-knife peeled the-apple

　　　　　"The knife peeled the apple"

The same pattern can also be seen with transitive alternates of inanimate unergatives. The relation between the transitive and the intransitive alternates of inanimate unergatives seems to conform precisely to the Agent-Instrument pattern. It obeys its two hallmarks: a) the original intransitive subject is realized with locative/instrumental preposition (*be-*) that is used also to license canonical/uncontroversial instruments; b) it seems that the alternation is not due to a derivational (valence-changing) operation, because there is no morphological marking on any of the alternations, while Hebrew does have morphological marking for other derivational operations. The pattern is demonstrated below ((51) repeated).

(60)   1.   a)   danny *cilcel **be-**pa'amon ha-delet*

Danny rang   in-bell        the-door

"Danny rang the doorbell"

b)   *pa'amon ha-delet cilcel*

Bell        the-door rang

"The doorbell rang"

2.   a)   *galit he'ira **ba-**panas*

Galit shone in-the-flashlight

"Galit shone the flashlight

b)   *ha-**panas he'ir*

The-flashlight shone

"The flashlight shone"

3.   a)   *ha-šoter šarak     **ba-**mašrokit*

The-cop  whistled in-the-whistle

"The cop blew the whistle"

b) *ha-mašrokit šarka*

The-whistle      whistled

"The whistle blew"

4.     a)     *ha-tinok hir'iš*    **ba**-*ra'ašan*

The-baby rattled in-the-rattle

"The baby rattled the rattle"

b)     *ha-ra'ašan hir'iš*

The-rattle    rattled

"The rattle rattled"

5.     a)     *ha-yeled šikšek*    **ba**-*trisim*

The-child jingled in-the-blinds

"The child jingled    the blinds"

b)     ha-trisim šikšeku

The-blinds jingled

"The blinds jingled"

To summarize so far, the hypothesis that the θ-role of inanimate unergatives is [+c-m] not only solves the mapping problem they present, but also accounts for the alternation they participate in, without stipulating an additional derivational process or relation between different verb entries.[24]

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[24] At the moment, I do not discuss the question why a subset of inanimate unergatives does not contain an agent role in the verbal concept, and thus does not exhibit the Agent-Instrument alternations. The inclusion of an agent role in the verbal concept seems to be empirical and depends on the eventuality the verb depicts, but, as already mentioned, is irrelevant to the identification of [+c –m] cluster per-se.

### 4.3 Inanimate unergatives in English

The question arises as to why in English, in the transitive alternate of inanimate unergatives (e.g. the transitive 'ring'), the original intransitive subject (e.g. 'the bell') is realized with what appears to be ACC case (as a direct object), while in Hebrew we have seen that it is realized with instrumental preposition.[25] Consider ((50d) repeated):

(61)    The flashlight beamed/shone

        We beamed/shone the flashlight

Recall that the fact that in Hebrew the original subject is realized as a PP in the transitive alternate was taken as evidence that this verb is not derived from the intransitive one via causativization. Does the fact that *flashlight* is realized as a direct object in English indicate that causativization occurred, as suggested in Reinhart (2002)? Not necessarily. English seems to exhibit a variety of arguments bearing what looks like ACC case, which realize very different θ-roles. Consider the following sentences:

(62)    a)    John/* The wind/* The war shot the bullet

        b)    John shot the victim

        c)    John shot the gun

(63)    a)    John/* The wind/* The party played the song

        b)    John played the piano

---

[25] There are numerous studies investigating the behavior of English Cases, including the instrumental Case, regarding the realization of the instrument as a direct object in the transitive alternate (as in examples above). A possible hypothesis would be to suggest that the relevant (instrumental) Case is licensed through a phonetically null head, which parallels *be-* in Hebrew. Another plausible hypothesis is that the instrumental Case in English is morphologically indistinct from ACC case (Botwinik-Rotem, 2006). The behavior of English Case is beyond the scope of this thesis.

It is clear that the thematic roles realized in the direct object position in the different sentences are different, and have independent meanings: in 62a) the accusative marked argument is a theme, in 62b) – a goal, and in 62c) – an instrument. Likewise, in 63a) the accusative marked argument is a theme whereas in 63b) it is an instrument. That these are the relevant thematic roles is demonstrated in the following examples:

(64)   a)      John shot the victim with a gun

        b)      *John shot the gun with a victim

(65)   a)      John played the song with/on the piano

        b)      *John played the piano with the song

One can observe that when more than one object is realized, it is obligatory that the true theme argument receives the accusative case while the others are realized with prepositions (as seen in (64a) and (65a)), whereas the other permutations result in ungrammatical sentences ((64b) and (65b).[26]

Furthermore, in Hebrew, which does not allow the interesting flexibility of English, only the argument in alternates (62a) and (63a) get the ACC marker (as shown in (66a), (67a), while the other arguments are necessarily realized with prepositions:

(66)   a)      *dan yara et ha-kali'a*

             Dan shot the-bullet-ACC

             "Dan shot the bullet"

---

[26] Additionally, if *gun* and *piano* had been truly theme arguments, we would have expected that their realization with accusative case would be grammatical. Recall (26c): "If the entry includes both a [+] cluster and a fully specified cluster, [/α,/-c], mark the verb with the ACC (accusative) feature". That rule implies that in the presence of a realized agent, theme role, [-c –m] is expected to receive accusative case.

b) *dan yara **ba**-rove*

Dan shot in-the-gun

"Dan shot the gun"

c) *dan yara **ba**-korban*

Dan shot in-the-victim

"Dan shot the victim"

(67) a) *dan nigen    et ha-šir*

Dan played   the-song-ACC

"Dan played the song"

b) *dan nigen   **ba**-psanter*

Dan played in-the-piano

"Dan played the piano"


Now, let us consider the following paradigm:


(68) a)    *The arrow shot

b)    *The victim shot

c)    The gun shot

(69) a)    ??The song played

b)    The piano played (softly)


We noticed in (64a) and (65a) that *shot* and *played* allow agents only. Therefore, reduction of the external role is expected to be inapplicable, since it applies only to [+c] clusters. Indeed (68a), (68b) and (69a) demonstrate the ungrammatical results of a hypothetical reduction operation. However, (68c), (69b) are acceptable. Why? The Agent-

Instrument pattern seems to account for it. The pattern is available for these verbs because first of all, we have an agent in the concepts; and secondly, *shoot* obligatorily takes the shooting instrument as a part of the concept, as does *play* for musical instruments. (62c) and (68c) are therefore an instance of the Agent-Instrument alternation, as are (63b) and (69b). This also provides further reinforcing evidence for the requirements for Agent-Instrument pattern presented in (58) above: we see that the theme argument is not required to enable the alternation.

Indeed, in spite of the superficial similarity, it seems unlikely that the verb in (62c) *John shot the gun* or in (63b) *John played the piano* is a lexical causativization of the verb in (68c) *The gun shot* or (69b) *The piano played (softly)*. However, this is precisely the account Reinhart provides for the alternation exhibited by 'theme' unergatives. It is possible to have alternations that superficially resemble lexical causativization, but are driven by an entirely different mechanism and manifest a different meaning relation. In this sense, I agree with L&R (1995) that the discussed alternations (*John rang the doorbell / the doorbell rang*) involving inanimate unergatives are not true causative alternations.

However, this is not to say that any transitive alternate of an inanimate unergative is necessarily a manifestation of the Agent-Instrument pattern. In the following 4.4 section I show the independent possibility of a causativization process and explore the differences between Agent-Instrument alternations and causativization: the way the semantics differ, the way the syntactic realizations differ and the way the mapping algorithms correctly predict the outcome.

Based on the above, it is clear that, in English, the ACC case cannot be taken as evidence in favor of identifying a theme role, and therefore cannot be taken as evidence in favor of a causative alternation. Therefore, the alternation in English can be analyzed on a par with the one in Hebrew, as an instantiation of the Agent-Instrument pattern.

### *4.4 Causativization vs. Agent-Instrument alternations*

I have demonstrated that a transitive alternate of inanimate unergatives in Hebrew is due to the Agent-Instrument pattern. However, nothing of what was said excludes the **independent** possibility of causativization of the intransitive alternate. Indeed, this possibility is realized, for example in the following cases:

(70)    a)    *ha-matos tas*

The-plane flew

"The plane flew"

b)    *ha-mexonit nas'a*

The-car        drove

"The car drove on"

c)    *ha-sira šata*

The-boat sailed

"The boat sailed"

(71)    a)    *dani tas **ba-**matos*

Dani flew in-the-plane

"Danny flew in the plane"

b)    *sara nas'a **ba-**mexonit*

Sara drove in-the-car

"Sara drove in the car"

c)    *yoni šat **ba-**sira*

Yoni sailed in-the-boat

"Yoni sailed in the boat"

(72) a) *dani hetis et ha-matos*

        Dani flew-CAUS the plane

        "Danny flew the plane"

    b) *sara hesi'a et ha-mexonit (la-musax)*

        Sara drove     the-car     (to-the-garage)

        "Sara drove the car (to the garage)

    c) *yoni hešit et ha-sira*

        Yoni sailed-CAUS the boat

        "Yoni sailed the boat"

The syntactic difference between the transitive alternate formed in the Agent-Instrument pattern (71) and the transitive alternate formed by causativization (72) is clear in Hebrew: the result of the causativization process will be morphologically marked, since this process always results in morphological marking.

The semantics of the two alternates is not the same either, though the difference may be subtle. Let us consider then Hebrew vehicle transport verbs such as *tas* (roughly *fly), nas'a (roughly drive) or šat (sail)* in more detail. First, let us establish that they are indeed unergatives. In order to do so, I will use some familiar tests detecting internal arguments: a) untriggered inversion. b) possessive dative. Consider the following data:

(73) a) *\*tasu kama metosim*

        Flew  a few  planes

        "A few planes flew"

    b) *\*ha-matos tas la-tayarim*

        The-plane   flew to-the-tourists

        "The tourists' plane flew"

c)  *nas'u arba mexoniot*

Drove  four  cars

"Four cars drove on"

d)  *ha-mexonit nas'a le-sara*

The-car      drove to-Sara

"Sara's car drove on"

e)  *šatu štei sfinot*

Sailed two ships

"Two ships sailed"

f)  *ha-sira šata la-dayagim*

The-boat sailed to-the-fishermen

"The fishermen's boat sailed"


The failure of the untriggered inversion test (73a,c,e) and the possessive dative test (73b,d,f) shows that the subject of the intransitive verbs in (70) is genuinely external and therefore they are unergatives.

These verbs display both the Agent-Instrument pattern (see (71)) and lexical causativization (see (72)). Let us see why this is so.

To begin with, the vehicle-type verbs contain references to a specific instrument - the event denoted could not take place without that instrument (some means/instrument of transportation: car, plane, ship). Our hypothesis therefore predicts that they allow the Agent-Instrument pattern because: i) they may be utilized by agents and ii) the intransitive subject has a causal implication (it may be viewed as causing a change), so the conditions are met, which once again shows that the requirements for the Agent-Instrument pattern in (58) have predictive power.

Another possibility that may come to mind for analyzing the alternation exhibited in (70)-(71) is to view both cases as instances of the same verb, whose external θ-role is [+c], rather than [+c −m]. This role is realized as [+c-m] in *ha-mexonit nas'a* 'The car drove on', and as [+c+m] in *sara nas'a ba-mexonit* 'Sara drove in the car'. I do not find this analysis plausible because the action that the car is performing is different from the action that the agent is performing with the car, i.e., it has clear instrumental characteristics. This is what L&R (1995) capture by the term "Spurious causative pair". Compare such pairs (*dani tas / ha-matos tas* – 'dan flew / the plane flew') with "real" [+c] roles, as in*: Max/ The wind opened the door*. In the latter, both Max and the wind are performing the same action. So, (70)-(71) manifest the Agent-Instrument alternation.

However, the verbs in (70) are also candidates for undergoing lexical causativization. Recall that lexical causativization applies in the lexicon and expands the verb's grid by 1 (adds an external argument) ((21),(22) repeated):

(74)    a)      They ran / galloped /walked ----> She ran /galloped /walked them

        b)      They worked hard ---> She worked them hard

It seems that causativization always adds an agent, not a cause [+c] (*agentivization*):

(75)    a)      The dog walked to his plate

        b)      Max/*The whip/*The hunger walked the dog to his plate

This is precisely the state of affairs as exemplified in (72):

(76)  a)  The plane flew ----> Danny flew the plane

b)  The car drove ----> Sara drove the car

c)  The boat sailed ----> the captain sailed the boat

The examples below (77) demonstrate that indeed only agent can be added, not a cause:

(77)[27]  a)  *The wind flew the plane

b)  *The accident drove the car (to the garage)

c)  *The sea sailed the boat

Hence, the data in (72) exhibits a lexical causativization operation, a claim supported by causative morphology in Hebrew.
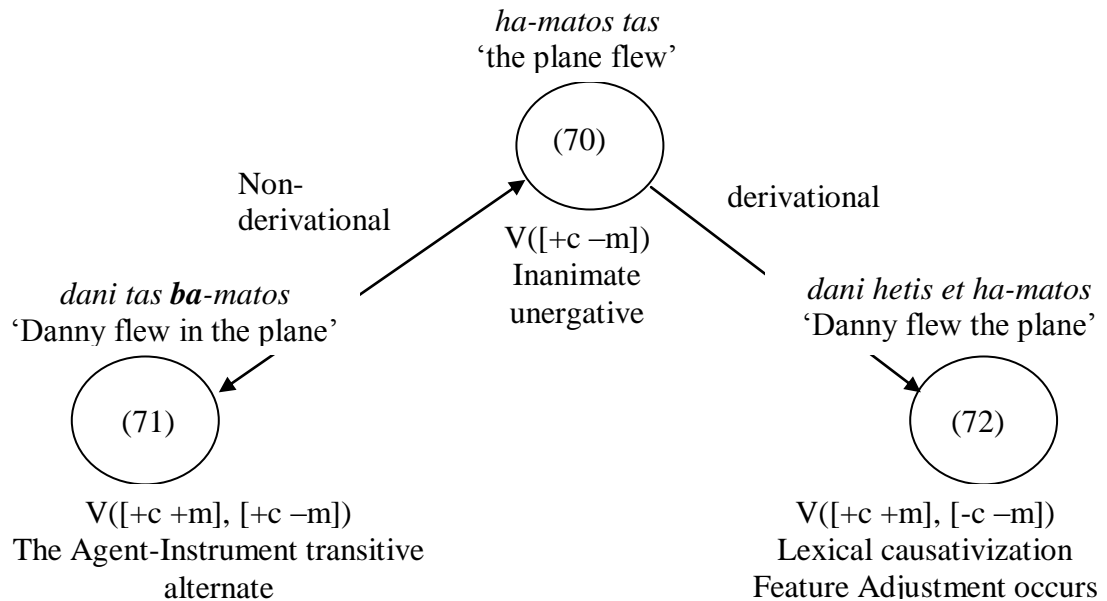
As to the semantic difference, note that in both transitive variants, the agent is using the vehicle, but in different ways: the Agent-Instrument pattern puts the emphasis on the object being an instrument, not a theme: the object is used to advance the agent from one location to another.[28] Importantly, the person using the vehicle need not be the one who drives it. For example, in *dan tas ba-matos* 'dan flew in the plane', *dan* need not be the pilot. On the other hand, in the lexical causativization alternate, the meaning is not that of usage only, but rather that of affecting an operation on the vehicle. So in *dan hetis et ha-matos* it is entailed that Dan affected the plane.

The following diagram summarizes the relations between the three verbal alternates.

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[27] The ungrammaticality illustrated in (77) sentences holds in Hebrew as well.

[28] I do not think that the preposition *be-* in sentences such as *dan tas ba*-matos 'dan flew in the plane' denotes a location only, since there is a clear instrumental use of the vehicle. The fact that the vehicle instrument happens to be large enough to sit in, and can be interpreted additionally as a location, does not render it something which is less of an instrument. This is supported by the failure of the Wh-question that tests a locative interpretation of the vehicle: *Eyfo dan tas le-amerika?* '*Where does Dan fly to America?'

(78)     Schematic diagram of relations of inanimate unergatives to transitives:[29]

*ha-matos tas*
'the plane flew'

(70)

Non-
derivational

derivational

V([+c −m])
Inanimate
unergative

*dani tas **ba**-matos*
'Danny flew in the plane'

*dani hetis et ha-matos*
'Danny flew the plane'

(71)

(72)

V([+c +m], [+c −m])
The Agent-Instrument transitive
alternate

V([+c +m], [-c −m])
Lexical causativization
Feature Adjustment occurs

It still remains to be established when each of the paths can be taken. Further research

is required to specify the requirements for each of the alternations, which is beyond the scope

of this thesis. As a preliminary illustration of the problem involved, consider the pair *šat-*

*hiflig* in Hebrew, both verbs meaning 'to sail'. As demonstrated in (71c) and (72c), for *šat*

there are two transitive alternates, one derived by lexical causativization and the other by

Agent-Instrument pattern. However, with *hiflig* only the Agent-Instrument pattern is

possible:[30]

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[29] It is interesting to note that we here have evidence that feature adjustment also occurs with inanimate unergatives and not only with agent unergatives: the original intransitive subject is realized with ACC case in the causative alternate – explain the connection between these two last sentences. *tas* fly V([+c −m]) → *hetis* fly-CAUSE V([+c +m], [-c −m]). See also Horvath and Siloni 2007 (and in particular 2007:32).

[30] Perhaps the ungrammaticality of lexical causativization of *hiflig* is due to the fact that Hebrew already uses causative morphology in the intransitive alternate. More rigorous research is required to establish this claim.

(79)    a)      *ha-sfina hifliga*

The-ship sailed

"The ship sailed"

b)      *ruti hifliga ba-sfina*

Ruti sailed   in-the-ship

"Ruti sailed in the ship"

c)      \**ruti hifliga et ha-sfina*

Ruti sailed-CAUS the-ship

"\*Ruti sailed the ship"

At this point, it is not clear what differentiates verbs such as *šat* from verbs such as *hiflig*.

I conclude then, that a transitive alternate of an inanimate unergative need not necessarily be the product of lexical causativization. Indeed, I have demonstrated that two different alternates are present side by side. One is derived by causativization and the other instantiates the Agent-Instrument pattern.[31] It is thus not possible that both are derived by causativization.

To summarize this section, there are two sets of inanimate unergatives in Hebrew; the first set consists of verbs which show a morphologically unmarked transitive alternate (that is, it exhibits the agent-instrument alternation), whereas the second set – of verbs which do not have a transitive alternate.

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[31] It even seems to be possible that the transitive alternate of the Agent-Instrument pattern will serve as an input for additional causativization, transforming the agent role into a theme role by feature adjustment, this time leaving the instrument intact: *dani tas ba-matos* 'Danny flew in the plane' ---> *ruti hetisa et dani ba-matos* 'Ruti flew Danny in the plane' i.e. V([+c +m], [+c –m]) ---> V([+c +m], [-c +m], [+c –m]). I wish to thank Aya Meltzer and Dr. Irena Botwinik for illuminating this possibility.

(80) Inanimate unergatives which allow a transitive alternate (formed by Agent-Instrument pattern):

*cilcel* (ring), *he'ir* (shine), *šarak* (whistle), *hir'iš* (rattle), *hivzik* (flash), *tirter* (rumble), *šikšek* (jingle),*zimzem* (buzz), *hivhev* (flicker), *cifcef* (twitter) *kirkeš* (clang)


(81) Inanimate unergatives which do not have a transitive alternate:

*bia'bea* (bubble), *hivhik* (gleam), *nacac* (glitter),*tasas* (sparkle), *nicnec* (twinkle), *hisri'ax* (stink), *heri'ax* (smell), *zaram* (gush), *ša'ag* (roar), *karan* (radiate), *yibev* (howl), *livlev* (bloom), *parax* (blossom), *hirkiv* (rot), *šigšeg* (flourish)


Verbs from both lists (80) and (81) appeared in the questionnaire which tested causal implication, described in section 3.2.3. The results show that speakers judged all of these verbs as having a /+c role, regardless of whether they exhibited a transitive alternate (for the full data, see Appendix A). These results strengthen the hypothesis that inanimate unergatives uniformly have the following thematic representation: V([+c −m]), independently of the alternation exhibited by some of them.

## 5 Summary

In this work, I investigated the domain of inanimate unergatives which hitherto received little attention, while focusing on two main aspects of their behaviour: the mapping problem and the transitive alternate problem.

Having illustrating the problems involved, we surveyed previous accounts and illuminated their flaws. Levin and Rappaport (1995) suggest that the verbs are *internally caused,* but their definition was vague and could be applied to unaccusatives as well. Moreover, the empirical diagnostic they proposed ("by itself" test) did not identify correctly

the required set of verbs. Likewise, the intransitive-transitive alternation inanimate unergatives exhibit was an exception to their system.

Reinhart (2002) suggests that inanimate unergatives and unaccusatives are thematically indistinguishable. Hence a condition stipulating a dependency on the arity of the verb was added to the argument realization theory, a condition whose sole purpose was to block inanimate unergatives from merging internally. Though an acceptable solution, the question of the necessity and the relevance of such a condition in a functional thematic system naturally arises.

Furthermore, Reinhart's analysis that the transitive alternate of inanimate unergatives is derived via causativization (2005) can not account for counter-evidence found in Hebrew and in Russian. The ground was ripe for a fresh analysis of the discussed verbs.

Based on an experiment designed to test speakers' intuitions about the external θ-role of these verbs, I have suggested the following hypothesis ((38) repeated):

(82) Main hypothesis: the subject of inanimate unergatives receives a [+c −m] role, the inanimate cause role.

The main hypothesis directly solves both problems mentioned above. The external mapping of the subject of these verbs, which in previous analyses required certain stipulations, is now straightforwardly predicted by the θ-system marking procedures, leading in addition to a considerable simplification of the system.

The transitive alternate problem is also accounted for: a verb with a [+c −m] role is predicted to participate in the Agent-Instrument pattern: For the subset of inanimate unergatives which also includes an agent in the verbal concept, a transitive alternate is expected, which is characterized by a lack of morphological marking and a canonical

instrumental preposition or instrumental Case marking on the internal argument. Such data is found in Hebrew and other languages. The theory, however, does not rule out the possibility of forming another transitive alternate from the inanimate unergative, by causativization, and indeed such verbs are also found in Hebrew.

Open issues left for future research are: i) whether the division between the set of inanimate unergatives that exhibits the Agent-Instrument pattern and the set which does not is stable across languages. Namely, whether the availability of an agent in the concept is purely empirical (in the case the sets are unstable) or additional semantics or world knowledge are at play (when the sets are stable). ii)  Similarly, what licenses a possible derivation via lexical causativization? Again, is it purely empirical and unstable across languages? Is the presence, or the absence, of a specific alternate formed by causativization explained by variations in a specific language's mental lexicon, or by independent linguistic reasons in a certain language? (say, morphological reasons).  Alternatively, if the set of transitive alternates derived via causativization is stable, then another constant factor is required which must be integrated into the lexicon-syntax interface.

**Appendix A: The Causal Implication Questionnaire ("Caused-NP" test)**

*A.1 The questionnaire: (originally in Hebrew)*

Age : _____     Sex : M/F   Native Language: _____

In the attached questionnaire there are 40 pairs of sentences.

The first sentence in each pair describes an event or a certain state of affairs. The second sentence expresses a statement on the event or the state of affairs of the first sentence.

You are kindly asked to mark, for each statement (the second sentence of each pair), whether you agree with it.

| | Sentences | Agree |
|---|---|---|
| 1) | *ha-miškafayim ne'elmu*<br>The glasses disappeared<br>*ha-miškafayim garmu la-he'almut*<br>The glasses caused the disappearance | Yes/No |
| 2) | *ha-xalon nišbar*<br>The window broke<br>*ha-xalon garam la-hišvrut*<br>The window caused the breakage | Yes/No |
| 3) | *ha-ša'on cilcel*<br>The clock rang<br>*Ha-ša'on garam la-cilcul*<br>The clock caused the ringing | Yes/No |
| 4) | *ha-ru'ax šarka*<br>The wind howled<br>*ha-*ru'ax *garma la-šrika*<br>The wind caused the howling | Yes/No |
| 5) | *ha-eš ba'ara*<br>The fire burned<br>*ha-eš* garma *la-be'era*<br>The fire caused the burning | Yes/No |
| 6) | *ha-radio hitkalkel*<br>The radio broke (down)<br>*ha-radio* garam *la-hitkalkelut*<br>The radio caused the breaking down | Yes/No |
| 7) | *ha-netifim nacecu*<br>The icicles gleamed<br>*ha-netifim* garmu *la-nicnuc*<br>The icicles caused the gleam | Yes/No |
| 8) | *ha-tinok nolad*<br>The baby was born<br>*ha-tinok garam le-hivaldut*<br>The baby caused the birth | Yes/No |
| 9) | *ha-iš tava*<br>The man drowned<br>*ha-iš garam la-tvi'a*<br>The man caused the drowning | Yes/No |

| | |
|---|---|
| 10) *ha-perax livlev*<br>The flower blossomed<br>*Ha-perax* garam *la-livluv*<br>The flower caused the blossoming | Yes/No |
| 11) *ha-ašpa hicxina*<br>The garbage stank<br>*ha-ašpa* garma *la-caxana*<br>The garbage caused the stink | Yes/No |
| 12) *ha-kadur nafal*<br>The ball fell<br>*ha-*kadur *garam la-nfila*<br>The ball caused the fall | Yes/No |
| 13) *danny cilcel ba-pa'amon*<br>Danny rang the bell<br>*ha-*pa'amon *garam la-cilcul*<br>The bell caused the ringing | Yes/No |
| 14) *ha-matos tas*<br>The plane flew<br>*ha-*matos *garam la-tisa*<br>The plane caused the flight | Yes/No |
| 15) *ha-ma'ayan bi'abe'a*<br>The spring bubbled<br>*ha-*ma'ayan *garam le-bi'abu'a*<br>The spring caused the bubbling | Yes/No |
| 16) *ha-zerem ša'ag*<br>The stream roared<br>*ha-zerem* garam *la-ša'aga*<br>The stream caused the roar | Yes/No |
| 17) *ruti patxa et ha-delet be-mafte'ax*<br>Ruthi opened the door with the key<br>*ha-*mafte'ax *garam la-ptixa*<br>The key caused the opening | Yes/No |
| 18) *ha-even hitgalgela*<br>The stone rolled<br>*ha-even* garma *la-hitgalgelut*<br>The stone caused the rolling | Yes/No |
| 19) *ha-iš met*<br>The man died<br>*ha-iš* garam *la-mavet*<br>The man caused the death | Yes/No |
| 20) *ronen saraf et ha-bayit ba-eš*<br>Ronen burned the house down by fire<br>*ha-eš* garma *la-srefa*<br>The fire caused the burning | Yes/No |
| 21) *ha-balon hitpocec*<br>The balloon blew up<br>*ha-balon garam la-hitpocecut*<br>The *balloon* caused the blowing up | Yes/No |
| 22) *ha-šemeš karna*<br>The sun *radiated*<br>*ha-šemeš garma la-krina*<br>The sun *caused* the radiation | Yes/No |
| 23) *rivka šavra et ha-xalon be-ala*<br>Rebecca broke the window with hammer<br>*ha-ala garma la-švira*<br>The hammer caused the breakage | Yes/No |
| 24) *ha-binyan hitmotet*<br>The building collapsed<br>*ha-binyan garam la-hitmotetut* | Yes/No |

| | | |
|---|---|---|
| | The building caused the collapse | |
| 25) | *ha-mexona tirtera*<br>The machine rumbled<br>*ha-mexona garma la-tirtur*<br>The machine caused the rumbling | Yes/No |
| 26) | *ha-delet nisgera*<br>The door closed<br>*ha-delet garma la-hisagrut*<br>The door caused the closure. | Yes/No |
| 27) | *ha-praxim navlu*<br>The flowers wilted<br>*ha-praxim garmu la-nvila*<br>The flowers caused the wilting. | Yes/No |
| 28) | *ha-kerax kaf'a*<br>The ice froze<br>*Ha-kerax garam la-kipa'on*<br>The ice caused the freeze | Yes/No |
| 29) | *ha-iš barax*<br>The man escaped<br>*ha-iš garam la-brixa*<br>The man caused the escape | Yes/No |
| 30) | *Yonatan tas ba-matos*<br>Jonathan flew in the plane<br>*ha-matos garam la-tisa*<br>The plane caused the flight | Yes/No |
| 31) | *ha-rakevet higi'a*<br>The train arrived<br>*ha-rakevet garma la-haga'a*<br>The train caused the arrival | Yes/No |
| 32) | *ha-sigaliyot parxu*<br>The lilies bloomed<br>*ha-sigaliyot garmu le-prixa*<br>The lilies caused the blooming | Yes/No |
| 33) | *ha-bayit nišraf*<br>The house incinerated[32]<br>*Ha-bayit garam la-hišarfut*<br>The house caused the incineration | Yes/No |
| 34) | *ha-barak hivzik*<br>The lightning flashed<br>*ha-barak garam le-hevzek*<br>The lightning caused the flash | Yes/No |
| 35) | *dan mile et ha-brexa be-mayim*<br>Dan filled the pool with water<br>*ha-mayim garmu la-milui*<br>The water caused the filling (up) | Yes/No |
| 36) | *ha-bayit ba'ar*<br>The house burned<br>*ha-bayit garam la-be'era*<br>The house caused the burning | Yes/No |
| 37) | *ha-mexonit nas'a*<br>The car drove (on)<br>*Ha-mexonit garma le-nesi-a*<br>The car caused the drive | Yes/No |

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[32] Hebrew has two distinct verbs associated with fire, both glossed as *burn* in English: *saraf* which is to burn an object, and *ba'ar* which is to be consumed by flames. The unaccusative alternate of *saraf, nisraf,* does not have an appropriate counterpart in English. I chose to *gloss* saraf as *incinerate* instead of *burn* to keep the separation.

| 38) *ha-ore'ax azav*<br>The visitor left<br>*ha-ore'ax garam la-aziva*<br>The visitor caused the departure | Yes/No |
|---|---|
| 39) *arimat ha-dešen hirkiva*<br>The compost rotted<br>*arimat ha-dešen garma la-rikavon*<br>The compost caused the rotting | Yes/No |
| 40) *ha-brexa hitmal'a*<br>The pool filled (with water)<br>*ha-brexa garma la-hitmal'ut*<br>The pool caused the filling up | Yes/No |

## A.2 Results

The results of the sentences which employed inanimate arguments are presented below. They have been classified into four groups: i. inanimate unaccusatives (such as: *the pool filled*), ii. Internal change of state verbs (such as: *the lilies bloomed*), iii. Emission verbs (such as: *the garbage stank*) and iv. Instruments in transitive verbs (such as: *Ronen burned the house down by fire*).

Each verb was assigned a "Causativity Level" value. This value is the percent of examinees who accepted the causal implication of the rephrased sentence. The experiment, then, tested the affects of the independent variable Verb Class on the Dependant variable Causativity Level.

| Independent variable:<br>Verb class | Dependant variable:<br>Causativity Level | Sentence |
|---|---|---|
| Inanimate Unaccusative | 2 | *ha-brexa hitmal'a*<br>The pool filled (with water) |
| Inanimate Unaccusative | 4 | *ha-binyan hitmotet*<br>The building collapsed |
| Inanimate Unaccusative | 6 | *ha-kadur nafal*<br>The ball fell |
| Inanimate Unaccusative | 8 | *ha-praxim navlu*<br>The flowers wilted |
| Inanimate Unaccusative | 10 | *ha-balon hitpocec*<br>The balloon blew up |
| Inanimate Unaccusative | 12 | *ha-even hitgalgela*<br>The stone rolled |

| Independent variable: Verb class | Dependant variable: Causativity Level | Sentence |
|---|---|---|
| Inanimate Unaccusative | 18 | *ha-delet nisgera* <br> The door closed |
| Inanimate Unaccusative | 22 | *ha-kerax kaf'a* <br> The ice froze |
| Internal Change of State verb | 34 | *ha-sigaliyot parxu* <br> The lilies bloomed |
| Internal Change of State verb | 38 | *ha-perax livlev* <br> The flower blossomed |
| Internal Change of State verb | 50 | *arimat ha-dešen hirkiva* <br> The compost heap rotted |
| Emission Verb | 52 | *ha-ma'ayan bi'abe'a* <br> The spring bubbled |
| Emission Verb | 68 | *ha-netifim nacecu* <br> The icicles gleamed |
| Emission Verb | 80 | *ha-zerem ša'ag* <br> The stream roared |
| Emission Verb | 88 | *ha-šemeš karna* <br> The sun radiated |
| Emission Verb | 94 | *ha-ša'on cilcel* <br> The clock rang |
| Emission Verb | 94 | *ha-mexona tirtera* <br> The machine rumbled |
| Emission Verb | 96 | *ha-barak hivzik* <br> The lightning flashed |
| Emission Verb | 98 | *ha-ašpa hicxina* <br> The garbage stank |
| Emission Verb | 100 | *ha-ru'ax šarka* <br> The wind howled |
| Instrument Transitive | 56 | *dan mile et ha-brexa be-mayim* <br> Dan filled the pool with water |
| Instrument Transitive | 58 | *danny cilcel ba-pa'amon* <br> Danny rang the bell |
| Instrument Transitive | 66 | *ronen saraf et ha-bayit ba-eš* <br> Ronen burned the house down by fire |
| Instrument Transitive | 68 | *rivka šavra et ha-xalon be-ala* <br> Rebecca broke the window with hammer |
| Instrument Transitive | 76 | *ruti patxa et ha-delet be-mafte'ax* <br> Ruthi opened the door with the key |

**Appendix B: cross linguistic evidence (Russian)**

Here are a few instances of the Agent-Instrument pattern in Russian. This alternation has two hallmarks: a), it is non-derivational, so that both alternates are morphologically unmarked. b) The internal (instrument) argument of the transitive alternate is marked with a canonical instrument preposition or an instrumental case. The data provided below then reinforces my analysis.

(1)  a)  *zvonok   zvonil*

   Bell        rang

   "The doorbell rang"

  b)  *phonar' svetil*

   Flashlight  shone

   "The flashlight shone"

  c)  *Svistok     svistit*

   whistle   whistles

   "The whistle whistles"

  d)  *Pogremushka   pobrjakivala*

   rattle       rattled

   "The rattle rattled"

  e)  *Samoljot letel*

   Plane     flew

   "The plane flew"

  f)  *Paroxod    plyl*

   Ship         sailed

   "The ship sailed"

(2)    a)    *pochtal'jon    (po)zvonil **v**    zvonok*

                Postman        rang        in  bell

                 "The postman rang/buzzed the doorbell"

    b)    *miri (po)svetila    phonarj**om***

                Miri shone        flashlight-INST

                 "Miri shone/beamed the flashlight"

    c)    Politcejskij svistel  **v**  svistok.

                cop  whistled        in  whistle

                 "The cop blew the whistle"

    d)    Rebjonok   pobrjakival   pogremushk**oj**.

                child  rattled           rattler-INST

                 The child rattled the rattler"

    e)    *Agent   letel   samoljot**om***

                Agent   flew   plane-INST.

                 "The agent flew in the plane"

    f)    *Agent     plyl       paroxod**om***

                Agent     sailed     ship-INST

                 "The agent sailed   in the ship"

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# מחקר של אנארגטיבים דוממים

חיבור זה הוגש כעבודת גמר לקראת התואר
באוניברסיטת ת"א M.A. "מוסמך אוניברסיטה"-

על ידי
יוסף פוטשניק

העבודה הוכנה בהדרכת:
פרופ' ג'וליה הורבט
פרופ' טל סילוני

מאי 2009

**תקציר העבודה**

קבוצה של פעלים עומדים אנארגטיביים (שמייצגיה הטיפוסיים הם פעלים כגון צלצל, *הבזיק, נצץ ושרק*), שבאופן מקובל זוכה לניתוח בו הארגומנט הממופה חיצונית (הנושא התחבירי) הינו בעל תפקיד תמטי של מושפע, מהווה אתגר לתיאוריות של מימוש ארגומנטים. שתי בעיות עיקריות עולות מהדיון בקבוצה זו. הבעיה הראשונה עניינה מיפוי: אם פעלים אלו הם זהים מבחינה תמטית לפעלים עומדים אנאקוזטיביים (בהנחה שנושאם גם הוא בעל תפקיד תמטי של מושפע), מדוע נושאם של הפעלים האנארגטיביים ממופה חיצונית, בעוד אלו של האנאקוזטיביים ממופה פנימית? מהו האילוץ, או התכונית הרלוונטית מבחינה תחבירית, המאפשרת ניבוי נכון של תוצאות המיפוי השונות?

הבעיה השניה שעולה מהדיון בקבוצה זאת היא שקיימים בה שקיימים בה יש פעלים שלהם יש מקבילה יוצאת: *The doorbell rang / The postman rang the doorbell. פעמון הדלת צלצל / הדוור צלצל בפעמון הדלת.* נשאלת השאלה אם כן מהו היחס בין הגרסאות העומדות והיוצאות של הפועל? מהו התהליך האחראי להווצרותם? האם מדובר בתהליך גזירה?

אני טוען כי הניתוח התמטי המקובל של הקבוצה, כי נושאו התחבירי של פועל בקבוצה הוא בעל תפקיד תמטי של מושפע, הוא שגוי מיסודו. ראשית אני מציע כי קבוצה זו של אנארגטיבים דוממים, בניגוד לקבוצת האנאקוזטיבים, הינה בעלת השתמעות של גרימה, כלומר, נושאם התחבירי של הפעלים מתאים **לא** לתפקיד של מושפע, אלא לתפקיד של **גורם דומם**. טענה זו מבוססת על ניסוי שתכננתי, המראה את החלוקה של פעלים אנאקוזטיבים ואנארגטיבים לשתי קבוצות מובחנות היטב, ותוצאותיו תומכות בטענתי כי השתמעות של גרימה נוכחת בפעלים האנארגטיביים, אך לא האנאקוזטיביים. כפי שאני מראה, מסקנה ישירה מכך היא ניבוי פשוט של המיפוי.

פתרון הבעיה השניה נובע ישירות מפתרונה של הראשונה: בהנתן פועֵל (agent) במושג (קונספט) הלקסיקלי, ניתן לממש אותו כארגומנט החיצוני בעוד שנושאו של הפועל העומד ממומש פנימית. סוג זה של אלטרנציות הוא מוכר: תפקיד תמטי של מכשיר (instrument), שהוא טיפוס מובהק של גורם דומם, ידוע בכך שהוא מאפשר את האלטרנציות האלו (שנקראו Manner verbs וכן גם -Agent Instrument alternations). לאלטרנציות אלו יש שני מאפיינים ייחודיים המקלים על זיהויין: ראשית, הן לא דריבציונליות (לא מעורב בהן תהליך גזירה), ולכן גם הפועל העומד וגם היוצא אינם מסומנים מורפולוגית. שנית, הארגומנט בעל התפקיד התמטי של המכשיר, או הגורם הדומם, ממומש במשפט עם הפועל היוצא באמצעות מילת יחס קנונית האופיינית למכשירים (כגון *with*, ב- ו-*עם*), או עם יחסה תחבירית של מכשיר בשפות המאפשרות זאת. טיעון זה נתמך בעדויות מעברית ומרוסית.