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Boom and Whoosh: Verbs of Explosion as a Change-of-State Class

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BOOM AND WHOOSH:
VERBS OF EXPLOSION AS A CHANGE-OF-STATE CLASS

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BOOM AND WHOOSH:

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ABSTRACT

BOOM AND WHOOSH:
VERBS OF EXPLOSION AS A CHANGE-OF-STATE CLASS

by Antonio de Jesus Hernandez

Much research has been done on various semantic verb classes, most notably on break-verbs. In this study, a new class of change-of-state verbs is proposed, namely verbs that encode an explode-event. The research presented here not only offers a new organization of certain change-of-state verbs, but also highlights the issues that are ever-present in the classification of verbs.

Eight verbs are investigated as possible members of this class: *blast, blow up, burst, erupt, explode, detonate, go supernova,* and *pop*. Using data from three corpora and survey results from 20 participants, this study explores the various verb alternations and constructions in which these explode-verbs participate across three distinct senses: change-of-state, appearance, and sound emission. In addition, in this study I look at the types of arguments that these verbs take, on semantic and syntactic levels. I conclude with the disqualification of *go supernova* as a possible member, due to strong syntactic dissimilarities with the other seven verbs. Overall, explode-verbs are shown to be unique enough to warrant the establishment of a separate sub-class under the Change-of-State macro-class.

ACKNOWLEDGMENTS

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Chapter One - Introduction

Out of the many events and actions that an individual can experience, few are as dramatic as those that involve the sudden and violent release of pressure: explosions. While we typically view such actions as destructive and devastating, the act of this sudden and violent release of pressure can vary from a simple and anti-climactic pop to the collapse and subsequent explosion of a star, whose magnificent result can rival the light of our own sun.

A verb class is a grouping of verbs, whose members not only share similar semantic characteristics but also behave alike in terms argument realization and alternations. Explode-verbs are those verbs that involve a sudden and violent release of pressure, which results in a change. While the verbs encompass a range of senses, they are united by this characteristic of a change of state.

In this project, I look at eight verbs, *blast, blow up, burst, detonate, erupt, explode, go supernova,* and *pop*, and determine whether they constitute a new verb sub-class. As such, I aim to answer the following questions:

1. What do these eight verbs have in common in terms of syntax and semantics?

2. How do the differences amongst verbs affect their relationship?

3. What evidence is there to warrant the creation of a new change of state sub-class?

In Chapter Two, I start by giving an overview of semantic verb classes. I also review the type of linguistic alternations (diathesis alternations) that allow one to group a

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set of verbs beyond the simple similarity in meaning. From this general approach, I

narrow my focus to a macro-level class of verbs that encode a change of state, a class that

is very much diverse. Lastly, I discuss the further division of change-of-state verbs on

the basis of their causation. The cause of an action can be one where an action needs an

outside entity to initiate the action (external causation) or where the responsibility of

starting said action lies with the object that undergoes a change of state (internal

causation).

In Chapter Three, I discuss the methodology involved in gathering my data.

Much of my information comes from three corpora, and it is here that I list the search

parameters for eliciting the various alternations and constructions, in which members of

the proposed class can participate. In addition, corpus data are used to show the

distribution of thematic roles and semantic categories of each verb's argument(s). This

chapter also details the implementation of the online survey component, where

respondents were asked to judge multiple sentences, some involving explode-verbs.

Chapter Four delves specifically into the *explode*-verbs themselves. I first outline

the semantic representation of explode-verbs based on their causation and transitivity.

Next, I shift my focus to the nature of arguments of each verb in terms of Actor and

Undergoer (as per Van Valin, 2005) in order to show the effect that arguments have on

syntax. Finally, I look at the participation of these verbs in various alternations across

three senses (change of state, sound emission, and appearance). Because explode-events

involve different phenomena, they can lead to different senses. This difference, in turn,

allows an explode-verb to behave less like members of this basic change-of-state class

and more like members of other classes.

Lastly, in Chapter Five, I use my findings derived from Chapter Four to discuss the relationship between these verbs, their shared characteristics, the impact of syntax on verb classification, and finally, whether there is enough evidence to warrant such a verb class.

It is important to note that, while the main objective of this research is the establishment of a new verb class, this research also serves to highlight the challenges that one encounters when organizing verbs into classes, mostly involving issues of polysemy and multiple membership across classes.

Chapter Two - Semantic Verb Classes

It is important to note that although the verbs of a given class may be synonymous with one another, perfect synonymy is not mandatory for the induction of one verb into a class. In fact, it is not unusual for one verb to be a part of other verb classes, because all that is needed for a semantic class to arise is for the verbs to possess "one or more shared meaning components [that] show similar behavior" (Levin, 1993, p. 17). For example, run-verbs such as *hurtle* and *leap*, all part of the general class of motion-verbs, are more synonymous to each other than they are to the verbs *climb* and *trot*, as the event they encode is more alike than what the other verbs would encode.

(1) I leaped/ hurtled over the fence.

(2) I climbed/ ?trotted over the fence.

Although the verbs differ in terms of the manner of movement, they are all unified by a manner of motion and lack of specific direction (cf. *ascend/ descend*). However, at

no point is the actual meaning of the individual verbs, with all of its specifics and nuances, ever considered in determining their inclusion into a class. However, the categorization of verbs does ultimately stem from our everyday interactions and other experiential stimuli, such as vision, hearing, and touch (Majid, Bowerman, Staden, & Boster, 2007). This notion is important to keep in mind, as the members of the proposed *explode* verb class overlap with other semantic verb classes, a property that is explained in Chapter Four, due to the different components of the explode-event that can be experienced (e.g., the bright flash, the loud boom, the shockwave, etc.).

The classification of verbs on the basis of their semantic and syntactic properties first began with Fillmore's (1970) investigation of hitting and breaking verbs and was greatly expanded in Levin's (1993) wide-scale classification of English verbs. In both cases, determining the possible membership of a verb was done via two methods. The first is determining similarity of meaning. The second is the participation of verbs in particular alternations and constructions. This is not to imply that these two methods are independent from each other. In general, the meaning of a verb determines its syntactic realization (Fillmore, 1970; Levin, 1993), whether it is the actualization of a verb's arguments (agent, patient, theme, etc.) or the interaction between various constructions (resultative, *way*-construction, locative, etc.). Thus, in order to justify the establishment of a semantic verb class, researchers focus on these surface-level realizations, referred to as diathesis alternations.

Diathesis Alternations

Levin (1993) lists eight major categories of alternations and constructions, which

include about 60 specific alternations and constructions. These alternations are used to diagnose the inclusion or exclusion of any verb to a given semantic verb class. Certain alternations, such as the conative alternation, are restricted to specific kinds of verbs, such as the verb *shoot*, while disallowing change-of-state verbs like *break*.

(3a) The hunter shot the deer.

(3b) The hunter shot at the deer.

(4a) The boy broke the toy.

(4b) *The boy broke at the toy.

Because certain constructions are irrelevant to the aims and scope of this paper, I will be focusing on those alternations present in the semantic verb classes of change-of-state verbs, verbs of sound emission, and verbs of appearance. The following is a short overview of a select number of the alternations and constructions that will be used, based on Fillmore (1970) and Levin (1993).

Causative/ Inchoative Alternation

The causative/ inchoative alternation involves two aspects: transitivity and cause. The first example (5a) has a transitive sentence with an agent or other causer (*incompetence*), affecting a change on a patient (*the ship*). In this first sentence, the responsibility of the act lies solely on the subject (incompetence). This contrasts with the intransitive, inchoative interpretation (5b), where the focus is on the patient and its change of state. Under this inchoative interpretation, an agent does not need to be understood to exist or be involved in this change of state. In this form, the patient can be interpreted as having initiated the change, in place of the agent.

(5a) Incompetence sunk the ship. [Causative]

(5b) The ship sunk. [Inchoative]

Fillmore (1970) and Levin (1993) view participation in this alternation as a hallmark characteristic of all change-of-state verbs. However, as Wright (2000) points out, participation in this alternation does not guarantee classification as a change-of-state verb. Verbs that do not encode a resulting change of state, such as *murder* and *destroy*, can still participate in this alternation, while verbs such as *blossom* and *bloom* do not alternate in this manner, even though they are change-of-state verbs (p. 22). Nonetheless, the causative/ inchoative alternation remains a useful diagnostic, especially when addressing the issue of causation.

Middle Alternation

The middle construction behaves very much like the previously mentioned causative/ inchoative alternation.[1] Both alternations involve an intransitive variant, whose argument undergoes the action indicated by the verb. The major difference is that the middle construction's intransitive variant (6b) has an understood agent involved in the act (Levin, 1993). In other words, although *Zoe* is not expressed (6b), we know that the plate could not have broken itself.

(6a) Zoe broke the plates.

(6b) Plates break easily.

Besides having an understood, albeit unexpressed agent, the middle construction lacks a specific time frame and requires a modal element or adverbial with *easily*.

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1   The middle differs from the passive voice in that it has a less involved actor, while the passive has a subsumed intent with the action. In addition, the passive can have an oblique agent, in contrast to the middle construction, whose agent is absent from the sentence.

Although the differences between the middle construction and the inchoative are subject to much debate, they are not the focus of this paper.

Instrument/ Subject Alternation

As seen below, this alternation involves an instrument (*with a baseball*) supplanting the agent as the subject of a sentence (7b). Whenever this promotion to subject-status takes place, it is understood that the instrument is merely an intermediary in transmitting force from the agent (*the boy*) to the patient (*the window*).

(7a) The boy shattered the window with a baseball.

(7b) The baseball shattered the window.

However, even though a verb may allow this alternation to occur, not all instruments can be promoted to the subject position. This depends largely on the verb's meaning and how the instrument is being used, whether as an intermediary or as a facilitator, as seen in the following examples from Levin (1993, p. 80).

(8) The crane loaded the truck. [Intermediary Instrument]

(9) *The pitchfork loaded the truck. [Facilitating Instrument]

Conative Alternation

In this alternation, the agent is understood to have attempted an action that may or may not have achieved the intended result. In example (10a), we see that the agent fired some projectile, which successfully hit the deer. This is not the case in Sentence (10b) where the agent fired the same projectile towards the deer, but we as listeners are unsure as to whether the deer was hit or managed to flee. Typically, it is the case that change-of-state verbs do not participate in this alternation, as they lexically encode the successful

realization of the intended act (Levin, 1993).

(10a) Bob shot the deer.

(10b) Bob shot at the deer.

Patient Omission Construction

This particular construction has the object of a normally transitive sentence disappear; this object being a patient or theme. Because the patient of a sentence completes the interpretation of a change of state, verbs that fall under the change-of-state verb class seldom participate in this construction. The construction usually appears with an adverbial (*at night*), which gives the whole sentence a repetitive (iterative) interpretation (Goldberg, 2000).

(11) Tigers kill [deer] at night.

Resultative Construction

The resultative construction involves the addition of either a post-verbal adjectival phrase or a post-verbal prepositional phrase, both of which indicate a specific result of the action indicated by the verb. Levin (1993) indicates that such constructions only predicate of objects and the subjects of intransitive sentences, though never of transitive subjects. This shows us that resultatives predicate of only patient arguments. This would make sense due to the fact that, like patients, resultatives encode a change of state or change of location. Because of this, resultatives can be further broken down into property or path resultatives (Goldberg, 2004).

Property Resultative

The property resultative encodes a change of state as a consequence of the verb.

In atelic verbs, this changes the aspect of said verbs by giving a telic interpretation. In addition, it may involve the addition of a fake reflexive, which fulfills the requirement for a patient to predicate of the following resultative.

(12) The water froze [solid].

(13) The glass shattered [into pieces].

(14a) I ran.

(14b) I ran myself to death.

Path Resultative (Directional)

Also referred to as a directional, this construction encodes a change of location on the part of the patient, but unlike the resultative form, the path resultative only manifests itself in the form of a prepositional phrase. The justification of this construction as a sub-type of the resultative will be further discussed in Chapter Four.

(15) John blasted music [into the next room].

The previously mentioned alternations and constructions serve as diagnostics for determining possible membership of verb into a class. Not only is it necessary to look at what alternations and constructions a given verb participates/ does not participate in, but it is also necessary to discuss the issues that impact the classification of verbs.

Problems Classifying Verbs

Cross-linguistic instances of a given semantic verb class can be difficult to ascertain. These verb classes might differ as to how diathesis alternations and constructions interact with the endemic constraints of a language. This difference in alternations can vary depending on the linguistic relationship that one language has with

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another. Even in closely related languages, verb classes can differ in terms of what is and is not allowed to alternate. Frense and Bennett (1996) note that although English verbs of creation do not participate in the conative alternation, such German verbs of creation (excluding cooking-verbs) are not bound by this restriction. The following example adapted from Frense and Bennet (1996, p. 310) illustrates this difference:

(16a)   Arno built the house. / *Arno built at the house.

(16b)   Arno   baute   das   Haus.

          Arno   PRET.*build*   ACC.*the*   *house*

(16c)   Arno   baute   a(n)   (de)m   Haus.

          Arno   PRET.*build*   PREP.*at.*   DAT.DEF.ART.   *house*

Frense and Bennett (1996) explain that the prepositional phrase (*am Haus*) indicates more attention towards the activity than the overall product, and as a result, argue that the term 'conative' may not be entirely appropriate for the purposes of this construction (p. 310). However, such issues are not really problems with semantic verb class as a whole, but rather with the methods of establishing semantic-syntactic relations amongst verbs. As Frense and Bernett point out, verbs in one language may need a more fine-tuned analysis than in another (p. 310). The exclusion of cooking-verbs (a subtype of change-of-state verbs) shows us that although verb classes may differ in terms of their alternations, the classes do not differ radically, most likely due the general process they encode (in this case change-of-state).

A second issue is whether it is appropriate to put forth the notion of verb classes as an explanation to this phenomena. Mufwene (1978) argues that in explaining the verb

behavior, we ought to look for individual semantic components, instead of verb classes. This argument stems from Mufwene's (1978) analysis of Zwicky's (1971, as cited in Wright, 2000, p. 9) *Manner of Speaking Verbs* and notes that the properties which unite certain members of a class, in this case manner of speaking verbs (*whisper, babble, drone*), can also be found in other verbs. In the place of verb classes, Mufwene proposes looking for individual semantic components as better explanations for similarities across verbs. Levin (1993) argues against this approach of using individual semantic components, saying that as ideal as they may be, they are too difficult to work with.

A third problem has to do with how inclusive (coarse-grained) or exclusive (fine-grained) the classification should be, when we begin establishing relations amongst classes. Levin (2009) states that our level of classification is important, as it influences the realization of arguments that correspond to a verb. Taking the verb *run* as an example, Levin gives three levels of classification: coarse-grained, medium-grained, and fine-grained. Beginning top-down with the coarse grained, this level classifies a verb as encoding either manner (In what way was the action done?) or result (What was achieved by the action?). A medium-grained classification further distinguishes between manner and result by adding the dimension of what the verb's meaning entails; in Levin's example, *run* is a manner of motion verb. The final classification level, fine-grained, involves the effect that the action has on a scene. In the case of *run*, it has the effect of displacement, as opposed to other manner of motion verbs, such as *dance* and *float*. The result is that *run* can alternate with directional locative prepositional phrases (Levin, 2009, February, p. 5). The difference of classification levels illustrates the constraints

that are placed on making generalizations (Levin, 2009, February, p. 5). Although most verbs within a class may participate in a given alternation or construction, some verbs will defy this generalization. In such instances, a further subordinated classification may be needed to adequately represent a set of closely-related verbs.

One final issue involves the semantic representation of verb class members, namely the structure they should all possess. As Wright (2000) notes, speakers are often extending the meanings of verbs, which explains why many verbs have membership in multiple verb classes (p. 10). The result of this semantic extension is that verbs will have varying semantic representations, depending on which sense of the verb is being used. Furthermore, speakers' judgments often present difficulty in establishing a clear semantic class. But as Wright points out, we focus our attention on the structure of prototypical members of the same class, from which we can derive a prototypical semantic representation (p.10). In addition, Wheeler (1996) argues that verbs that are members of multiple classes, have a basic or core membership from which all other memberships are derived. With this approach, we can reconcile the issue of classifying verbs and acknowledging polysemy.

Change-of-State Verbs

As its name suggests, the type of verbs involved encode a change to the state of an object. This class includes the well-researched *break*-verbs, *bend-verbs*, cooking verbs, entity-specific change-of-state verbs, calibratable change-of-state verbs, and the miscellaneous sub-class of other alternating change-of-state verbs. Regardless of this variety, all change-of-state verbs encode a result or product of an action, and it comes as

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no surprise that all verbs in this coarse-grained class are either Accomplishments or Achievements.

The aim of the following sections is to show the diversity of verbs in this large class by highlighting the commonalities and dissimilarities amongst them. By "surveying the terrain" of the change-of-state verb class, it is my intent to show where the proposed *explode*-type verb class can be situated.

Break-Verbs. Break-verbs have been referred to as *pure change-of-state verb*s (Levin 1993) and involve a particular change of state: the change of material integrity of an object. Research into this particular verb class began with Fillmore's (1970) analysis of *hit* and *break* verbs, whereby diathesis alternations were used to differentiate the two verbs, most notably the causative/ inchoative alternation. In addition to the causative/ inchoative alternation, *break* and *hit* verbs were also analyzed with the Transitive-with-Instrument construction, Body/ Part Ascension, and the *with*/*against* alternation.

Causative/ Inchoative Alternation

(17a) John broke the vase.

(17b) The vase broke.

(18a) John hit the wall.

(18b) *The wall hit.

Transitive with Instrument

(19) John broke the vase [with a bat].

(20) John hit the wall [with a hammer].

Body/ Part Ascension (Fillmore, 1970, pp. 126, (23)–(26))

(21a) I broke his leg.

(21b) *I broke him on the leg.

(22a) I hit his leg.

(22b) I hit him on the leg.

Participation in the w*ith/ against* alternation (Fillmore, 1977, pp. 74–78)

(23a) Perry broke the fence with the stick.

(23b) Perry broke the stick against the fence.

(24a) Perry hit the fence with the stick.

(24b) Perry hit the stick against the fence.

What makes these alternations interesting is that even though these verbs involve the sudden transfer of force from an agent to a patient, the patient's ability to have its physical integrity compromised is ultimately a hallmark property of *break* events (Fillmore, 1970, p. 135). In contrast, surface contact verbs like *hit* need not have their properties altered in any way whatsoever. In other words, a person can hit a wall without the wall necessary being affected or altered by it. Indeed, as Fillmore (1970) points out, both verbs presuppose physical properties of the patients that receive the force described by the action. It would not make sense to use the verbs *break* or *hit* with objects that are, respectively, incapable of being broken or touched.

In addition to *hit* verbs, *cut* verbs have also been compared to *break* verbs. Like the two previously discussed classes, verbs of cutting also involve the transfer of force to a patient. Unlike verbs of hitting, *cut* verbs do encode an impingement of a patient's

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physical integrity, albeit with more precision involved. Unlike verbs of breaking, *cut*

verbs do lead speakers to infer by what means something was cut, while *break* verbs are

silent about the action's manner (Levin, 1993, p. 242). The major difference between

break and *cut* verbs is, again, the inability of the latter to participate in the causative/

inchoative alternation. The following is an overview of the relationship between the

three verb classes, based on the previously discussed alternations, as per Fillmore (1970).

Table 1: Comparison of Alternation Participation (*hit*, *cut*, and *break)*

Alternations/ Constructions	Hit	Cut	Break
Causative/ Inchoative	No	No	Yes
Transitive with Instrument	Yes	Yes	Yes
Body/ Part Possessor Ascension	Yes	Some	No
With/ Against	No	No[2]	No [3]
Conative	Yes	Yes	No

The importance of reviewing break-verbs lies in the many shared characteristics

between this class and the proposed explode-verb class, due to the fact that both classes

encode a pure change of state. In addition, both classes involve compromising the

material integrity of the patient, albeit via different ways.

Bend-Verbs. Whereas break-verbs portray events that involve the compromise of

physical integrity, the change of state involved in bend verbs has to do with the overall

change of shape of the object without affecting its integrity. In addition, unlike break-

verbs (and other pure change-of-state verbs), the event of bending is reversible. In terms

of diathesis alternations and constructions, bend verbs pattern exactly like break-verbs

with a couple of notable caveats. This is seen in the limited participation of certain verbs

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2   Alternates only with *against.*
3   Alternates only with *with.*

(*crinkle, rumple*, *wrinkle*) in the resultative construction. Although break-verbs and bend-verbs alternate almost alike, it is their lexical meaning that ends any stalemate between the two, once again showing the importance of meaning in verb classes.

Table 2: Alternation Differences between *break* and *bend* (Levin, 1993)

Alternations/ Constructions	Break	Bend
Causative/ Inchoative	Yes	Yes
Transitive with Instrument	Yes	Yes
Body/ Part Possessor Ascension	No	No
With/ Against	No [4]	No
Conative	No	No
Resultative	Yes	Some

Cooking-Verbs. While all of these verbs refer to the cooking process, not all members of its class carry the simultaneous connotation of creation or transformation. In addition, some verbs (*plank* and *shirr*) do not participate readily in the causative/ inchoative alternation, with problems arising in the inchoative form. Furthermore, Levin (1993) notes that basic cooking verbs, such as *cook*, *bake*, *boil*, and *fry*, have "the widest range of properties" (p. 244) when it comes to their arguments. In other words, because these four verbs have a more general meaning, as opposed to *sauté, crisp,* and *deep-fry*, they allow for greater participation of alternations/ constructions. There is no mention, though, of whether all cooking verbs can appear in the transitive with an Instrument. Certain verbs, such as *microwave, grill,* and to an extent *fry,* have the instrument already defined at the lexical level. These verbs are restricted enough to disallow almost all possible instruments, while at the same time creating instances where mentioning the

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4   Alternates only with *with.*

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lexically defined instrument is awkward/ redundant.[5]

(25) I cooked/ boiled/ baked/ the food with a(n) pan/ pot/ oven.

(26) ?I microwaved the meal with a microwave oven.

(27) I fried the chicken with a skillet/ ?with a fryer.

Table 3: Alternations of Cooking-Verbs (Levin, 1993)

Alternations/ Constructions	Cook
Transitive with Instrument	Some
Causative/ Inchoative	Some
Middle	Yes
Instrument Subject	Yes
Conative	No
Cognate Object	No
Resultative	Yes
Adjectival Passive Participle	Yes

The main observation illustrated by the cooking-verb class is that not all members of a verb class are of equal rank. More general-sense verbs have greater syntactic-semantic "maneuverability" than their more specialized sisters. However, the ability to have an instrument/ manner lexically-encoded to the verb appears to be largely restricted to members of the cooking-verb class.

Entity-Specific Change-of-State Verbs. This category includes verbs whose patients are constrained in terms of the verb's semantics. In their literal uses, these range from very patient-specific verbs such as *blossom* and *bloom* (which are often associated with plant or nature patients), to verbs with a less-constrained array of patients, such as

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5   However, if the instrument is modified, the sentence becomes acceptable (e.g., *I fried the chicken with a deep-fryer*). The reason behind this is that mentioning an unmodified instrument (*a fryer*) conflicts with the general meaning behind the verb *fry* (i.e., two non-specific elements, the fryer and the act of frying, are interpreted as needlessly redundant).

corrode and *erode*. In addition, these verbs seldom appear in the causative form, appearing almost always in the inchoative form. This is due to the fact that these verbs have the change of state process initiated by the patient or some particular characteristics of said patient. The result is that very rarely is there an agent or other external cause involved in an event. In other words, the verbs described here have internal causation.

Table 4: Alternations of Entity-specific Change-of-State Verbs
(Levin, 1993)

Alternations/ Constructions	Entity-specific
Inchoative	Yes
Causative	Rarely
Cognate Object	No
Adverbial Passive Participle	Some

Calibratable Change-of-State Verbs. One of the characteristics that the previously mentioned change-of-state verbs have, with the notable exception of cooking-verbs, is the inability to be graded. Calibratable change-of-state verbs describe those events that involve a gradual change to a patient, this gradation being a lexical property of the verbs (Levin & Rappaport Hovav, 2010). This contrasts with break-verbs, whose event takes place instantaneously to a human observer. In these instances, the patient is the only argument in the sentence, thus making verbs of this class incompatible with the causative alternation.

A unique characteristic of this class, which distinguishes it from other gradable changes of state, is its participation in the Possessor Subject Possessor-Attribute Factoring Alternation in the intransitive (Levin, 1993, pp. 77-78).

(28) The price of flour rose.

(29) Flour rose in price.

In this alternation, the patient fluctuates between the attribute and the actual thing. When the attribute is the subject of the sentence (28), the thing (*flour*) discussed will appear as a kind of genitive of quality (possessor attribute). When this thing (*flour*) appears as the subject (29), the attribute will be relegated to a post-verbal PP, with *in* as the preposition (possessor subject).

Table 5: Alternations of Calibratable Change-of-State Verbs (Levin, 1993)

Alternations/ Constructions	Calibratable Change
Inchoative	Yes
Possessor Subject/ Possessor-Attribute Factoring	Yes
Causative	No
There-Insertion	No
Locative Inversion	No
Cognate Object	No
Adjectival Progressive Participle	Yes
Adjectival Perfective Participle	No

Other Alternating Change-of-State Verbs. The last category of verbs encoding a change of state given by Levin (1993) is a miscellaneous category, with many verbs arranged according to their suffix. Here we find those verbs ending with the suffixes *-en*, *-ify, -ize, -ate*; change-of-color verbs (*blacken, whiten, redden*); and zero-derived verbs derived from adjectives (*cool, clear, sour*).

Table 6: Alternations of Other Alternating Change-of-State Verbs (Levin, 1993)

Alternations/ Constructions	Other Alternating
Causative/ Inchoative	Yes
Middle	Yes
Instrument Subject	Yes
Conative	No
Locative	No
Locative Inversion (Transitive)	No
Locative Inversion (Intransitive)	No
There-Insertion	No
Cognate Object	No
Resultative	Yes
Adjectival Passive Participle	Yes

This class of change-of-state verbs also happens to hold five of the eight explode-type verbs: *blast*, *burst*, *explode*, *pop*, and, under the *-ate* subcategory, *detonate*. In addition, the relationship to verbs of appearance is noted by Levin (1993), stating that these verbs differ from appearance-verbs in that they do not participate in the *swarm*-type alternation, locative-inversion alternation, and *there*-alternation when in the intransitive (p. 346). In general, she adds, this failure to participate in these three alternations is a shared characteristic of change-of-state verbs, although she does not give examples of this failure throughout her discussion.

We have seen that the coarse-grained class of change-of-state verbs includes a variety of events that revolve around the concept of an object undergoing some change in its makeup. They range from those that involve a serious and sudden compromise of the patient's integrity (break-verbs) to those events that involve a more superficial change of

state (bend-verbs). But causation is also an important aspect involved in the identity of these verbs. As we have seen, not all verbs participate in the causative/ inchoative alternation. Verbs, such as calibratable change-of-state verbs, entity-specific verbs, and some cooking-verbs, appear only in the inchoative and rarely in the causative. This division in causation leads to another way of looking at this verbs, namely between externally-caused and internally-caused change-of-state verbs.

Internal vs. External Causation in Change-of-State Verbs

The notion of causation revolves around who or what initiates an action. According to Smith (1970), the distinguishing feature between internal and external is the notion of control. Externally controlled events have an agent which was in command of exerting a change on a patient. Conversely, internally controlled events have the patient being in control of the action and the resulting change of state that it underwent; responsibility of this control could not be ceded to any other entity. Levin and Rappaport Hovav (1995) move away from this notion of control, refining the concept with one of internal and external causation, and stemming from the fact that "control" entails volition, something which is incompatible with our understanding of what it means to be a patient or a theme.

Although the focus of this chapter is primarily on change-of-state verbs, the distinction between internal and external causation can also be applied to non-change-of-state verbs (Levin & Rappaport Hovav, 1995). Even though they share similarities, causation is not the same as the word "causative", as the latter is a specific linguistic construction that adds a sub-event to an already existing event. Of the eight proposed

explode-event verbs, two are internally-caused change-of-state verbs (*erupt* and *go supernova*), while the remaining six are externally-caused (*blast, blow up, burst, detonate, explode, pop*). The characteristics of these verbs in regards to causation are discussed in Chapter Four

Internal Causation. Internally-caused events have their patient as the causer of the action described in the verb, allowing one to interpret the event as occurring spontaneously, assuming the internally-caused event is not found in the causative. Because of this, they largely appear in the inchoative, and their semantic representation reflects this simple structure (Levin & Rappaport Hovav, 1995):

(BECOME (x<STATE>))

Being single-event verbs, internally-caused change-of-state verbs have only one lexical argument, leading Levin and Rappaport Hovav (1995) to conclude that such verbs cannot occur in the transitive, and thereby causative, form. This is shown in the following sentences where the transitive version is ungrammatical, even when the causer has an intimate semantic relationship with the action involved.

(30a) The flowers bloomed.

(30b) *The gardener/ sun bloomed the flowers.

(31a) The wood decayed.

(31b) *The insects decayed the wood.

However, Wright (2000) points out that under certain conditions, internally-caused change-of-state verbs appear as transitives, claiming that such transitivity is to be expected if the verb is underlyingly unaccusative. Under such infrequent instances of

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transitivity, a metaphorical interpretation of the event is used, and often with a nature-related causer (Wright, 2000, p. 98). When it comes to patient or patient-like arguments, Levin and Rappaport Hovav (1995) claim that internally-caused verbs place severe restrictions in terms of what they can be, similar to what was seen in the entity-specific change of state class (Levin, 1993). However, McKoon and Macfarland (2000) note that there is little restriction in terms of what can constitute a patient for internally-caused verbs, owing to creative/ figurative usage of the language (p. 845).

The restriction to nature-related causers is to be expected due to humans being considered the prototypical agents. This is not to say that human causers are impossible to have with internally-caused change-of-state verbs, as Wright's (2000) research provides examples of these agents in action.

(32) Jane night-bloomed my lemon lily. (4a., p. 104)

(33) A one-inch-wide, low-growing perennial shrub, it blooms white flowers in
    the summer. (6b., p. 105)

The process by which internally-caused verbs transitivize is explained by Wright (2000) via Template Augmentation. This process involves the basic structure of the verb becoming more complex by adding a causative sub-event. Furthermore, Wright notes that the reason for the basic form being monodic is due to the fact that, while all internally-caused verbs appear in the intransitive, some do not have "clear transitive variants" (p. 175). If the basic form were complex, she argues, then we would be at a loss in explaining the detransitivization of these verbs.

External Causation. On the other end of the spectrum, externally-caused events

are those that require an outside source to set off the action. This does not always mean that an agent is needed as the causer of an event, as instruments can just as easily take the place of instigator (which explains why internally-caused events seldom, if ever, take an instrument). In addition, these verbs have a more complex semantic representation and are dyadic in their argument realization (Levin & Rappaport Hovav, 1995):

(α) CAUSE (BECOME (x <STATE>))

The dual-event structure of externally-caused change-of-state verbs shows us the placement of the agent/ external cause (in the form of α) as a separate event from that which results in the patient changing state (in the form of x). Because of this characteristic, externally-caused verbs frequently participate in the causative/ inchoative alternation, with the causative being the basic form. In explaining the alternation to the inchoative form, Levin and Rappaport Hovav (1995) turn to the process of detransitivization. Under this process, transitive verbs, which are causatives, become intransitive, or inchoative. As a result, their semantic representation is simplified to a single-event structure. However, there are restrictions in terms of which causative verbs can become intransitive/ inchoative. Externally-caused change-of-state verbs ending with the -ize and -ify suffixes seldom appear in the intransitive/ inchoative.

(34a) Sally broke the window.

(34b) The window broke.

(35a) The British colonized India.

(35b)*India colonized. ["India" = Patient]

(36a) This painting exemplified the style of Picasso.

(36b) *The style of Picasso exemplified. ["The style of Picasso" = Patient]

In such cases of detransitivization, inchoativity can arise if the causer lacks control over said event (Van Voorst, 1995, as cited in Wright, 2000, p. 51). Similarly, transitive verbs can become intransitives if "the eventuality can come about spontaneously without the volitional intervention of an agent" (Levin & Rappaport Hovav, 1995, p. 102). This means that verbs, such as *break* and *explode*, can appear in the intransitive/ inchoative, as the act of breaking can be conceptualized as occurring without an agent intending to break or explode something. This is further made evident if we look at causative verbs that do not encode a change of state, such as *murder*, which always require an expressed volitional agent and an expressed patient.[6]

(37a) John murdered Steven.

(37b) *John murdered. ["John" = Agent]

In terms of the kinds of arguments that these verbs can field, externally-caused verbs often appear with a human causer (Wright, 2000). However, McKoon and Macfarland (2000) note that these verbs face little restrictions in terms of their agents and patients.

While we can construe internal events that have some external cause and vice versa, McKoon and Macfarland (2000) argue that the lexical encoding of verbs "imposes a particular construal on the event" (p. 835). Even though we know the sun causes flowers to bloom, thereby making the sun an external cause, sentences illustrating such an external cause still sound awkward.

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6 Verbs such as *murder* can appear in the intransitive, but only in certain environments (e.g., *Who murdered yesterday? John murdered yesterday.*).

(38) ?The sun bloomed the flowers.

This imposition highlights the importance of the underlying semantic structure of the verbs; this structure being relevant to the linguistic realization of the verb. Such restrictions are in accordance with Grimshaw's (1993) distinction between the structural meaning and the content meaning of a verb (cf. Goldberg, 1995; Levin & Rappaport Hovav, 1995; Pinker, 1989). Structural meaning, as its name suggests, is that which determines the syntactic realization of the verb (lexical arguments, compatibility with diathesis alternations, etc.). In contrast, content meaning is all of the non-syntactic information that a given verb holds. It is in the latter form of meaning where speakers can construe an external event, sometimes in opposition to the verb's structural meaning.

Diagnosing Causation. While the concept of transitivity is very much intertwined with that of causation, the two are not always the same, as verbs with a low degree of transitivity are still classified as being externally-caused. In pursuit of a diagnostic that did not rely on intuition, McKoon and Macfarland (2000) took the transitive probability of both types of verbs and found little distinction between internally-caused and externally-caused change-of-state verbs. An externally-caused verb such as *explode* was found to have a transitivity score of 0.07 whereas an internally-caused verb, *thaw*, had a transitivity score of 0.61 (Table 2, p. 838). Clearly, transitivity alone could not be used to decisively differentiate between both types.[7]

The next three diagnostics involved looking at the arguments of both causation-types. This was done by classifying the subject and object of a token under the semantic

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7 Following McKoon and Macfarland's (2000) efforts, Wright (2000) differs in terms of transitivity, finding less instances of transitive internally-caused change-of-state verbs. This may indicate that transitivity may be more useful than McKoon and Macfarland suggest.

categories of Artifact (man-made objects), Nature (nature-related objects and phenomena), Animate (volitional beings), Body-Part, and Abstract (events and ideas). An analysis of the subjects of intransitive sentences (McKoon & Macfarland, 2000, p. 839) and another concerning the objects of transitive sentences (McKoon & Macfarland, 2000, p. 841) produced no significant distributions between internally and externally caused verbs. Because the object of a transitive sentence and the subject of an intransitive sentence are essentially the same in terms of thematic roles (Levin & Rappaport Hovav, 1995), McKoon and Macfarland's (2000) conclusions show that patients are not good indicators of causation, nor are there special restrictions as to what can appear with either causation-types, somewhat counter to Levin and Rappaport Hovav (1995) and Levin (1993) in regards to internally-caused verbs and entity-specific change-of-state verbs, respectively.

The final diagnostic involved the subject of a transitive sentence. McKoon and Macfarland (2000) explain this focus on the subject, as the causative sub-event is independent from the change of state encoded by the second sub-event, thereby not restrained nor affected by said change of state (p. 842). This argument is similar to that of Levin and Rappaport Hovav (1995), where they note that external-cause arguments (such as transitive subjects) initiate the motion of events but may not always see such events unfold (p. 94). Looking at literal interpretations of both internally and externally caused verbs, McKoon and Macfarland (2000) confirmed Wright's (2000) findings that internally-caused change-of-state verbs almost always had forces of nature as their transitive subjects, although they do mention instances where humans indirectly set

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events into motion. Externally-caused change-of-state verbs faced no restrictions

regarding their transitive subjects, counter to Wright's (2000) findings of human causers

being the most frequent. For figurative interpretations, there was no significant

difference between both causation-types, although they noted that abstract patients often

appeared with abstract causers (McKoon & Macfarland, 2000, p. 844).

I have discussed ways of discerning between the two causation types, although I

do not wish to imply that they exist in a mutually-exclusive relationship. Certain verbs

can be problematic in categorizing, such as those verbs which have unexpected transitive

probability scores (<0.10 for externally-caused verbs and >0.40 for internally-caused

verbs, as can be surmised from Table 1, p. 837 of McKoon and Macfarland, 2000). Verbs

such as *atrophy* and *erode* are classified by McKoon and Macfarland (2000) and Levin

(1993) as externally and internally-caused change-of-state verbs respectively, even

though these classifications are controversial. Wright (2000) suggests that although verbs

such as *erode* are ultimately internally-caused, there is the very real possibility that

membership in a causation type is gradient (pp. 124-125). For verbs such as *atrophy* and

fade, Wright questions their classification, although does not give a reason for this doubt.

This controversy in the classification of a verb may stem from the fact that a given event

can be conceptualized differently depending on context. This controversy is further

muddled by the fact that transitivity and intransitivity are the most common ways of

encoding cause. Such instances where a verb has an equal chance of being transitive as

being intransitive, or when its transitive probability is not congruent with that of other

members in its class, become problematic when a speaker relies on their intuition.

Chapter Three - Methodology

In showing the characteristics and nature of the proposed explode-verb class, three types of corpora and an online survey were utilized.

The Corpus of Contemporary American English (COCA) comprises of 450 million words found in various forms of media from 1990 to 2012. These forms of media include fiction, popular magazines, newspapers, spoken discourse, and academic texts (Davies, 2008-). This corpus was used primarily in calculating the transitivity probability for the eight proposed verb members, as done in McKoon and Macfarland (2000). This was done by taking a sample of 500 token for each verb in the past tense *-ed* form. From this batch, the first 200 tokens were counted, making sure to filter out any perfect passive participles and (for *burst*) any remaining zero-derived nouns. The transitivity probability was calculated by taking the number of transitive tokens divided by the combined total of transitive and intransitive instances. The *-ed* form of a verb was chosen, in order to mitigate the appearance of present active particles, infinitives, and (for *pop*, *burst*, *blast*) zero-derived noun forms that were incorrectly tagged as verbs. Passives were interpreted as either transitive or intransitive, depending on the presence of an oblique agent. These criteria were used in all corpus searches, except in those cases where the number of tokens was too low. For example, a separate usage of the COCA was needed in determining instances of the macrorole of Actor (Van Valin, 2005) for the verb *erupt*. Tokens of this verb were not restricted to a particular grammatical form, in order to elicit the maximum number of Actors possible. In such cases, the grammatical form of the verb was not deemed to be very influential on the realization of thematic roles.

The second corpus used was the TIME Magazine Corpus, with 100 million words, ranging from 1923 to the present (Davies, 2007-). This corpus was used to gauge the distribution of the macroroles Actor and Undergoer across the eight verbs. These macroroles were further divided into the five semantic categories used by McKoon and Macfarland (2000). The categories include the five categories (Artifact, Nature, Animate, Body Part, and Abstract) plus a subcategory of Artifact that I used called "Munition". This addition was motivated by an observation made in McKoon and Macfarland whereby *explode* often collocated with rockets, missiles, or bombs (i.e., munitions). Thus, "Munition" includes those types of man-made objects that are designed to explode.

The third corpus used was the Corpus of Global Web-Based English (GloWbE), which includes 1.9 billions words from 1.8 million websites across 20 English-speaking countries (Davies, 2013). Because of its sheer size, I chose this corpus as an auxiliary source for the verb *go supernova*, as there were few tokens in the past tense in both the COCA and TIME Magazine Corpus. In order to keep the data uniform, tokens were limited to those from the United States.

The purpose of the online survey was to gauge the acceptability of certain alternations with all eight explode-verbs. The reasoning behind this was that, although instances of a verb participating in a particular alternation could be found, such instances were not indicative of their acceptability in the minds of speakers. In other words, speakers' grammatical judgments are difficult to gauge with a corpus alone.

The online survey was conducted using the Fluidsurvey.com service, where 20 English-speaking participants were asked to judge the acceptability of 72 sentences, and

rate the perceived strength of each verb. The sentence acceptability component had each verb participate in three constructions: patient-omission, property resultative, and path resultative. The patient-omission construction section had 12 sentences, where the participants were asked to interpret the sole argument of the sentence as an agent/ causer and not a patient/ recipient of force . In these sentences, the verb is in the present tense, while the subject is an agent, following the structure of Determiner Noun + Verb. After the verb, I included an adverbial phrase (either an adverb or a prepositional phrase) to further highlight the fact that the subject is not to be interpreted as a recipient of the verb's action. For the property and path resultative components, the structure of the sentence was also Determiner Noun + Verb (simple past), except that the post-verbal element was a prepositional phrase (and in the case of property resultatives, also a bare adjective).

In addition to rating the acceptability of constructions, participants were also asked to judge whether each verb was acceptable in the transitive. All sentences were judged using a scale ranging from [1] COMPLETELY UNACCEPTABLE to [5] PERFECTLY ACCEPTABLE, and involved a subject determiner phrase (DP), a simple past verb, and an object DP. The final component of the survey involved the participants classifying the eight verbs in terms of perceived intensity with [1] being WEAKEST and [5] being STRONGEST.

In selecting the participants themselves, the only factor that was deemed important was competency in English. Sixteen participants listed English as their first language, while the remaining four had more than 10 years of experience. The reason

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behind this was to mitigate the impact that the first language might have on the skills of an incipient learner of English. Because verb classes can vary in terms of which diathesis alternations and constructions their members can participate, it was important that participants have a strong understanding of English.

Chapter Four - Explode-Verbs

As noted earlier, explode-verbs can be found across multiple verb classes, illustrating the many ways that an explode-event can be construed. However, regardless of this distribution, explode-verbs have at their core a change-of-state interpretation. This is reflected by the fact that all proposed verbs are either achievements (*erupt* and *go supernova*) or causative achievements (*blast, blow up, burst, detonate, explode, pop*). Achievements involve an event being both punctual (incapable of being measured by time), telic (having an end), and dynamic (change of state). The former characteristic restricts the interpretation of explode-verbs when appearing in progressive sentences such as the ones presented below.

(39) The man is exploding the building.

(40) The pipes are bursting.

In those instances where these verbs are found in the progressive form, they denote iterative actions (i.e., a sequence of individual explosions). These progressive forms and their iterative interpretation can be found when the object undergoing the change of state (via explosions) is framed as being, to a degree, large and complex. In addition, there is an opportunity in such situations for an external agent to intervene and abort the final change of state.

(41) The oil refinery is exploding, but we can save a part of it.

(42) ?The car is exploding, but we can save a part of it.

In the above sentences, (41) is deemed acceptable because of our understanding of the world. We know that an oil refinery houses many interconnected containers capable of exploding, and it is this collection of containers that can be encoded holistically as a single, large, and complex entity: the oil refinery. Although a car is compromised of multiple parts, a speaker would have a difficult time encoding such a scenario where all these various parts can explode independently, while still allowing an individual to abort the final change of state (the complete destruction of the car). As such, instances of explode-verbs in the progressive refer to multiple explode events, that are smaller in comparison to the large affected object, in essence representing iterative events. These iterative interpretations are found with other punctual verbs, such as semelfactives. These restrictions, however, apply if an explode-verb appears in its basic change of state sense or as an appearance-verb. In both senses, the action denoted has its verb aspect as an achievement, as seen in sentences (43) and (44). For those instances of explode-verbs as verbs of sound emission and appearance, the restriction falters due to a shift in verb aspect, in this case a shift from Achievement to Active Accomplishment.

(43) The army was blasting the village. [Change of State/ Achievement]

(44) The musician exploded onto the stage. [Appearance/ Achievement]

(45) They were blasting music at the crowd. [Sound Emission/ Active Accomp.]

Representation of Explode-Verbs

As discussed in Chapter Two, events requiring an external cause have a complex

semantic representation. For the externally-caused explode-verbs (*blast, blow up, burst, detonate, explode, pop*), this involves a causative sub-event and change of state sub-event. The following is the logical structure of externally-caused explode-verbs, with *x* being the external cause and *y* being the patient that undergoes the change of state. Such dyadic structures have been shown to be the basic forms for all externally-caused pure change-of-state verbs.

[**do'** (x)] CAUSE [INGR **exploded'** (y)][8]

The structure above denotes two events, linked by the CAUSE chain. To the left, we have an activity sub-event that is represented on the syntactic level by the causer argument. To the right of CAUSE, we have the subevent that simultaneously denotes the predicate of the sentence (in this case, the actual explode-verb) and the resulting state. The operator INGR (for 'ingressive') signals that the event in question is an Achievement. However, this structure only applies to externally-caused change-of-state verbs that are found in the transitive. Internally-caused change-of-state verbs can also derive this structure whenever they find themselves in the transitive via the process of Template Augmentation (Wright, 2000). The following is the logical representation for internally-caused explode-verbs.

INGR **erupted'** (x)

For intransitive forms of internally-caused explode-verbs, the basic form is monadic, or single-argument. The major difference between this simple form and the previously seen structure lies on the absence of clear clause. Not only is the connector

8   The logical representations shown for explode-verbs are in the form listed by Van Valin (2005). Although different in form from those used in Levin and Rappaport Hovav (1995), McKoon and Macfarland (2000), and Wright (2000), they all represent the same organization of events and subevents.

CAUSE absent, but so is the external subevent. As such, the sole argument of this structure, *x*, is interpreted as being a patient and the causer of the change entailed by the predicate (represented in this case as **erupted'**). This is also the same structure that externally-caused explode verbs derive when they undergo detransitivization (Levin & Hovav-Rappaport, 1995).

Given this ability for any verb to transitivize or detransitivize, it is important to see what the likelihood of transitivity is for each verb, namely because transitivity is often used to represent cause or agency in a given event. Transitivity across the explode-verbs is possible, although the probability of each verb appearing in the transitive can vary. The following table lists the explode-verbs in terms of their transitivity probability, with internally-caused explode-verbs listed in italics.

Table 7: Transitive Probabilities for Explode-Verb Tokens (COCA)

	Total Tokens	Transitive Tokens	Transitive Probability
blasted	200	109	0.54
detonated	200	75	0.37
popped	200	58	0.29
blew up	200	57	0.28
exploded	200	11	0.05
burst	200	3	0.01
erupted	200	0	0
went supernova	5	0	0

With the externally-caused explode-verbs, there is a general trend of transitivity amongst four verbs (blow up, detonate, blast, and pop), with the average transitivity probability being 0.33. This is lower than, but still similar to, McKoon and Macfarland's (2000) average externally-caused change-of-state verbs with high probability, the mean being 0.48 (Table 2, p. 838). The remaining externally-caused explode verbs averaged at 0.03, closer to McKoon and Macfarland's average of 0.06 for their lower probability change-of-state verbs. The inclusion of *burst* is rather surprising because, intuitively, it should be expected to appear transitively. A reason for its low probability may be due to the verb being frequently collocated with a resultative phrase. Phrases such as *burst into flames, into laughter,* and *into the room* were the most frequent in the 200 token sampling. This is unsurprising because it is often the case that such phrases collocate with particular verbs (Goldberg, 1995).

Because of the ubiquity of resultatives collocating with *burst*, it was necessary to determine what the type frequency of this 200-token sample from COCA was. A type for this endeavor was defined as the following post-verbal element (not including particles), such as adverbials or adjectives. Table 8 shows the transitive probabilities based on type frequency.

Table 8: Transitive Probabilities for Explode-Verb Types (COCA)

	Total Types	Transitive Types	Transitive Probability
blasted	167	109	0.65
detonated	131	64	0.49
blew up	123	57	0.46
popped	168	57	0.34
exploded	137	11	0.08
burst	105	3	0.03
erupted	153	0	0
went supernova	2	0	0

As one can see, the transitive probabilities have increased for all verbs, although the increase was not so different for the verbs *explode* and *burst*. Naturally, the internally-caused explode-verbs, *erupted* and *went supernova*, were not affected in terms of transitive probability, as there were no transitive tokens to begin with. The low transitive probability for *burst* is still unsurprising, because, although I eliminated common prepositional phrases, the variety of prepositional phrases is still present in this sampling. A larger sampling of *burst* may provide more instances of the transitive, but given its ubiquitous collocation with resultative phrases, a low probability could still result.

For the internally-caused explode verbs *erupted* and *went supernova*, we see that

both verbs had no instances of transitivity, regardless of token or type frequency.   A separate search in the COCA, with the search parameters changed to allow past-tense and non-past-tense forms of the verb *erupt* plus a following noun, resulted in 6 tokens of transitivity. *Go supernova* (29 total tokens), on the other hand, had no instances of transitivity, which is to be expected as the verb *go* by itself very rarely appears in the transitive form. This scarcity of transitive tokens highlights one of the parameters at work with internally-caused verbs, namely that such verbs can, but do not need to, appear in the transitive (Wright, 2000).

There is, however, a major difference between the likelihood of a verb appearing in the transitive and whether the form would be acceptable to speakers. As seen with *burst,* a verb's lower probability of transitivity is not always indicative of how likely it will be interpreted as being felicitous. Nevertheless, verbs with lower probabilities of transitivity do produce conflict for speakers. Survey results from the transitivity component focused on three explode verbs (*explode*, *erupt*, and *go supernova*), which all scored rather low probabilities. These were mixed with another externally-caused explode verb (*blow up*) and other change-of-state verbs (*ferment, corrode, rust, break, melt, bloom, freeze,* and *blossom*). The acceptability scale ranges from [1] being "Completely Unacceptable" to [5] as "Perfectly Acceptable".

For *explode*, the verb appeared in three transitive sentences, with the only difference being the subject, which in a transitive sentence, encodes the agent or cause.

Table 9: Acceptability Ratings for *exploded* in Transitive Form

	Average Score	Number of Participants
1. The bomb squad exploded the device.	3.85	20
2. The meteorite exploded the countryside.	2.4	20
3. The tank exploded the building.	3.15	20

For Table 9, we see that out of the three sentences, only the first sentence was somewhat acceptable, with an average score of 3.85. This is still markedly lower than *blow up* in the transitive (*The demolition team blew up the building*), with an average score of 4.85. The acceptability of the first sentence is in stark contrast with the second sentence where participants felt that the sentence was generally unacceptable, with an average score of 2.4. The third sentence showed a varied distribution of acceptability, perhaps indicating that the sentence was awkward at best, with an average of 3.15. It can be concluded that even though transitivity is possible for the verb *explode,* it seems to favor human agents as their transitive subjects, while being ambivalent towards intermediary instruments. However, natural phenomena seem to be clearly unacceptable as transitive subjects. Although *explode* has a low transitive probability, its preference for human agents over natural causers clearly points to it being an externally-caused change-of-state verb.

For the verb *erupt*, a similar, albeit inverted, case is seen in comparison to *explode*. Recall that internally-caused change-of-state verbs do not often encode a causer and when they do, it is usually some sort of natural phenomenon (Levin, 1993; Levin & Rappaport Hovav, 1995; Wright, 2000).

Table 10: Acceptability Ratings for *erupted* in Transitive Form

	Average Score	Number of Participants
1. The volcano erupted molten lava.	4.57	19
2. The terrorist erupted the car.	1.55	20
3. The internal pressure erupted the volcano.	3.25	20

In Table 10, the first sentence shows that natural phenomena are generally viewed as acceptable causers, while human causers are found to be unacceptable. Interestingly, a similar distribution as the one seen with *explode* appears, when the transitive subject is an intermediary force. Because both pressure and a volcano can be construed as natural forces or phenomena, there may be further lexical specification of the causer on the part of the verb. Similarly, the object (in this case, *molten lava*) has a close relationship to the verb, based on the speaker's real-world knowledge.

Lastly, the verb *go supernova* showed a clear incompatibility with the transitive form. As mentioned before, this incompatibility is most likely due to the verb being an instance of *go* plus a resultative phrase. Because a resultative sentence shares an argument with the accompanying verb, and the shared argument is a patient, it is ungrammatical for the verb phrase *go supernova* to take an agent or a causer (Goldberg, 1995; Levin & Rappaport Hovav, 1995).

Table 11: Acceptability Ratings for *went supernova* in Transitive Form

	Average Score	Number of Participants
1. The news went supernova the man.	1.1	20
2. The immense pressure went supernova the star.	1.2	20

The transitivity of a verb appears to be constrained by the arguments that make up said verb. In these instances, we clearly see the effect that semantics has on syntactic surface features. As such, in order to better understand these eight verbs, it is important to investigate the semantic distribution of their arguments.

In terms of the intensity that these verbs were perceived to have, participants found that the verb *explode* was the most intense, with *go supernova* at a close second. The fact that *go supernova* is ranked as second highest is surprising, as the event in question is a cosmic event, and thus would be expected to easily overtake the general verb *explode*. The verb *pop*, in contrast, scored the lowest with 1.8. All other verbs grouped rather closely between 2.5 and 4. To reiterate the elicitation process, participants were asked to rank the eight verbs according to their perceived intensity from [1] being WEAKEST to [5] being STRONGEST.
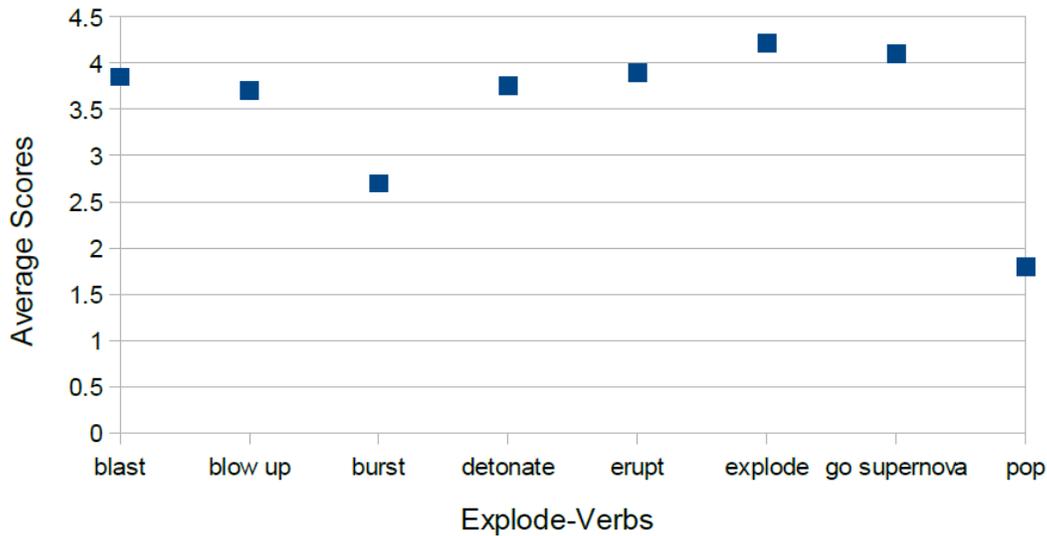
Figure 1. Participants' Perceived Intensity Results for Explode-Verbs

The perceived intensity of an act allows speakers the ability to choose a verb that will suit their need, in this case, choosing a verb depending on the power and effect it entails. This can play a role in not only which verb is used, but also in terms of which kind of patient can appear with a given verb.

Argument Roles

Given that explode-verbs are change-of-state verbs, the only types of thematic roles we should see are agent, patient, and instrument. However, because of the multiple senses that these verbs have, the role of theme is also present, especially when explode-verbs pattern like verbs of appearance or verbs of sound emission. Because of this variety, I have chosen to use Van Valin's (2005) concept of macroroles, which are generalizations of thematic roles. The macro-role of Actor incorporates the thematic roles of Agent, Experiencer, and Instrument, while the Undergoer macro-role includes

Patient, Theme, and Stimulus. In essence, an Actor is the most agent-like argument of a sentence, while an Undergoer is the most patient-like argument in a sentence (Van Valin, 2005). Although patient and theme have semantic differences between them, the former involving a change of state while the latter a change of location, Van Valin (2005) argues that they are essentially the same in terms of grammar. This is seen in their ability to surface as the object of a transitive sentence or the subject of a passive sentence (p. 60). Agents and instruments are somewhat similar grammatically, especially when the instrument is viewed as an intermediary instrument. Both agent and instrument can be viewed as the cause of some series of events, although we know from real-world knowledge that instruments are not capable of initiating an action by themselves. In this case, intermediary instruments and agents can be linguistically construed as being initiator or causer of externally-caused explode-verbs.

In order to show the types of Actors and Undergoers, I used the semantic categories found in McKoon and Macfarland (2000), with the minor adjustment of including the "Munition" category as a subclass of the "Artifact" category. Recall that the "Artifact" category refers to man-made objects, while the "Nature" category encompasses natural phenomena. The "Animate" class includes volitional beings, usually people, but also including countries in a metonymic sense. The category "Body Parts" involves the corporal components of volitional beings, while the "Abstract" category refers to events and ideas, that cause or receive an action.

Taken from the TIME Magazine Corpus, the first 75 tokens of every explode-verb were selected and classified in terms of these six semantic categories, with the

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elimination of mislabeled zero-derived nouns and past participles. For the phrasal verb *blow up,* I eliminated tokens that referred to the act of blowing air in an upward direction, as opposed to its other sense encoding a change-of-state (a detailed discussion of the difference between the two forms is provided in Chapter Five). Past-tense *-ed* forms of the verb were the input for almost all verbs, except for the verbs *erupt* and *go supernova*, whose search parameters included non-past tense forms. This was done because of the very low degree of transitivity that is characteristic of most internally-caused verbs, with transitivity being non-existent with *go supernova*. An initial search of both internally-caused verbs produced no tokens with a discernible Actor. Thus, the corpus search was expanded to look for all instances of the verb *erupt* with a noun phrase following it. While this makes the methodology seem inconsistent, tense does not seem to be particularly relevant in terms of describing the distribution of argument roles.

  Actors. As previously noted, the Actor is the most agent-like argument of a sentence. As such, limiting ourselves to only looking at agents would not allow us to see a more complete picture of which causers are permissible and which ones actually manifest themselves.

Table 12: Distribution of Actors of Explode-Verbs (TIME Magazine Corpus)

	Artifact	Munition	Nature	Animate	Body Part	Abstract
blasted	5	3	5	43	0	0
blew up	2	6	0	28	0	0
burst	0	0	0	0	0	0
detonated	5	0	0	32	0	2
exploded	0	0	0	4	0	0
popped	1	0	0	17	0	1
erupted	1	0	4	0	0	1
went supernova	0	0	0	0	0	0
Total	14	9	9	124	0	4

Animate and Artifact/ Munition

Across externally-caused verbs, Animate beings were the most frequent types of arguments in terms of event causers. We see this pattern with every one of these verbs, although the overall number of Actors appears to be constrained by the transitivity of the verb, which explains the four tokens for *explode*. Recall that instruments could also be found as the causer of an effect, allowing externally-caused verbs to participate in the Instrument/ Subject Alternation. Thus, it comes as no surprise that Artifacts and Munitions are the second most frequent types of arguments, with the notable exception of *pop*'s single token.

Nature and Abstract

Instances of Nature and Abstract tokens were very rare, which is to be expected as causation usually implies a degree of agency, whether it is immediate (involving agents) or intermediary (involving instruments). Because natural phenomena and abstract

concepts are usually not under human control, and thus not involving volition, the encoding of natural/ abstract cause is problematic (recall the acceptability results of the externally-caused verb *explode*). Nevertheless, the mere presence of such arguments is rather interesting, as all Nature Actors for externally-caused verbs in the TIME Magazine Corpus search were found with the verb *blast*.

(46) the 8-km-wide (5 miles) comet and blasted out a tremendous crater...

(47) an iron asteroid blasted out Arizona's three-quarter-mile-wide Meteor

Crater...[9]

(48) a large object, five or six miles across, blasted a 120-mile-wide crater...

The appearance of a Nature Actor is rather unusual with an externally-caused verb as this type of argument is more prevalent with internally-caused verbs. A possible explanation for these Nature Actors is may lie with the context of the sentence, namely certain verbs are more likely to appear with particular nouns due to real-world conditions. In this case, *blast* has a stronger relationship with meteors, comets, etc. (natural phenomena) than other explode-verbs, such as *detonate* or *blow up*. A greater sampling of externally-caused explode-verbs could also result in more Nature Actors across all verbs, although it is likely that *blast* will still have more Nature Actor tokens compared to other externally-caused explode-verbs.

Abstract Actors refer to events or actions that cause some sort of change of state. Their collocation with explode-verbs is used to show a degree of damaging severity, which is indicative of what a prototypical explode-event is: dangerous, severe, and

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9   In Sentences (46) and (47), the verb *blast out* differs from the standard, *blast*, in that the particle *out* acts a type of resultative. Although particles have the ability to greatly change the semantics and syntax of a verb, in this case, *out* merely specifies the result that *blast* already entails.

significant.

(49) His hard flying in one air show popped 500 rivets during a prohibited climb...

(50) ...three marriages that were detonated by electronic affairs.

The Abstract Actors pattern more like Instruments in that they can be viewed as intermediary acts/concepts that indicate agency. This is seen in Sentence (49), where we know that ultimate responsibility lies with an animate Actor, and not the act itself. Sentences (49) and (50) also show us that both literal and metaphorical causation surface alike linguistically (i.e., there is no overt syntactic difference between literal and metaphorical causers).

Undergoers. Unlike Actors, there were no issues of transitivity to constrain the appearance of Undergoers. This is unsurprising because much of the information needed for encoding a change of state is found with the Undergoer.

Table 13: Distribution of Undergoers of Explode-Verbs (TIME Magazine Corpus)

	Artifact	Munition	Nature	Animate	Body Part	Abstract
blasted	12	0	5	24	1	15
blew up	42	9	3	11	0	7
burst	19	0	1	38	0	14
detonated	5	59	0	4	0	8
exploded	20	18	3	6	0	30
popped	28	0	1	21	2	20
erupted	2	0	11	9	0	53
went supernova	0	0	0	0	0	0
Total	128	86	24	103	3	147

A search for the verb *went supernova* produced no results, therefore I conducted a

separate search with the same parameters on the much larger COCA and GloWbE

Corpus.

Table 14: Cross-Corpus Distribution of Undergoers for *went supernova*

Corpus	Artifact	Munition	Nature	Animate	Body Part	Abstract
COCA	0	0	4	1	0	0
GloWbE	0	0	7	0	0	1
Total	0	0	11	1	0	1

Animate

The most significant issue concerning Animate Undergoers was determining

whether a given argument was a Theme or a Patient. Verbs such as *blast* and *pop* have an

extended sense of something or someone appearing in an event frame. This stems from

the frequent collocation of a path resultative with these verbs.

(51) He popped into the Warner Bros. Studio Store...

(52) … a panting Secret Service agent burst into the room...

(53) They just popped up among the civilians.

A characteristic of resultatives is their ability to change the thematic role of the

Undergoer. For example, unergative verbs such as *run* have a Theme as their only

argument. However, adding a property resultative allows this Theme to be interpreted as

a Patient.

(54a) He ran.

(54b) He ran himself to death.

This same process is found with path resultatives that collocate with *burst* and

pop. If one looks at the intransitive versions of these verbs with no resultative, we see

that the intransitive verb's single argument is a clear patient. In addition, the sentence is interpreted as inchoative.

(55) He popped/ burst. [He = Patient]

(56) He popped/ burst into the room. [He = Theme]

As such, the argument type of the verb is always a Patient that encodes a change of state, and any change to the role comes from the application of a path resultative. The verb's meaning may change in order to accommodate this difference in argument types (Goldberg, 2004, p. 543).

Unlike *burst* and *pop,* the Animate Undergoers of *blast* involve a clear Theme when the verb is interpreted as one of Sound Emission or Directed motion. In the former sense of Sound Emission, the action involves harsh and destructive criticism done to the Undergoer. In this way, *blasted* acquires an extended metaphorical sense, derived from the core explode-sense. When used as a means of criticizing, the verb *blast* usually takes three arguments: critic, criticized, and reason for criticism.

(57) ...the actress Elizabeth Taylor blasted President Bush for not doing enough

about AIDS.

(58) ...he obliquely blasted Branford Marsalis for selling out to the Tonight

Show...

An alternative explanation for this extension involves *blast* being used instead as a hit-verb, under the macro-class of Verbs of Contact by Impact (Levin, 1993, pp. 149-150). The event here is not interpreted as one of sound-emission *per se*, but rather as a figurative attack via firearms or explosives. This metaphorical sense already has

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precedent, as it falls under the conceptual metaphor of ARGUMENT IS WAR (Lakoff & Johnson, 1980). Such controversy further highlights the problems that arise when classifying polysemous verbs, affecting the surrounding arguments and the overall interpretation of the sentence.

The latter sense of Directed Motion was mostly seen with the collocation of *blast* with the particle *off*. Again, this can be seen as a metaphorical extension of *blast*'s core explode-verb meaning, as it is not possible to *blast off* without some violent release of force, whether in a literal or figurative sense. It is interesting to note that in this sample of 75 tokens, there were no cases of Animate Undergoers who underwent some sort of change of state. A larger sample size may reveal instances of Animate Undergoers that are the recipients of explosive force, but this may pale in comparison to the prevalence of Animate Undergoers as recipients of criticism. This more frequent usage of *blast* as a verb of sound emission is problematic due to the significant differences between explode-verbs (which at their basic are change-of-state verbs) and verbs of sound emission; the former class encoding a result and the latter class encoding a manner.

(59) When seven astronauts blasted off aboard the space shuttle Atlantis...

For other instances of Animate Undergoers, the action referred to the act of suicide bombing or homicide. This was especially true with the three verbs *blow up*, *detonate*, and *explode*. Other externally-caused verbs such as *blast* and *burst* did not show instances of such acts, while *pop* may have failed to include such Undergoers because of its lower intensity (as opposed to the greater sense of violence and damage that *blow up*, *detonate*, and *explode* give).

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Artifacts and Munitions

Artifacts and Munitions were the most common types of Undergoers across most externally-caused explode verbs, with the exception of *blast*. McKoon and Macfarland (2000) state that *explode* often involves some sort of explosive device (Munition) as the Patient. While the data gathered shows that man-made things are the most frequent, Munitions by themselves do not constitute a majority across all verbs and semantic categories. However, we do see a strong relation between *explode* and *detonate*, whereby both verbs rather frequently involve an explosive device as the Undergoer. Looking at all verbs, we see that only *explode*, *detonate*, and *blow up* show instances of Munitions as the Undergoer.

Nature

The internally-caused verbs *erupt* and *go supernova* had the highest instances of Nature-related phenomena. Internally-caused verbs seem to have a higher propensity for these argument roles, although all verbs appear to allow Nature Undergoers. Again, this illustrates the semantic restrictions that internally-caused verbs face when realizing their arguments.

(60) a vulgar swish that would erupt fire and brimstone...

(61) ...when stars in our cosmic neighborhood went supernova.

(62) MOUNT ST. HELENS erupted late last week.

Body Parts

The category of Body Parts was the least represented category in both Actor and Undergoer analyses. In one case, the body part underwent a figurative change of state

(Sentence 63), while in others it referred to either a body part appearing or creating a

popping sound because of some outside force (Sentences 64 and 65).

(63) On Nov. 22, 1963 somebody blasted the skull of America...

(64) Then Vinny Testaverde, their quarterback, popped his Achilles tendon...

(65) He put me in a scissors lock once and accidentally popped my rib.

Abstract

This category had the second highest amount of tokens across all verbs, except

went supernova which had only one token. In many instances, the Abstract Undergoer

referred to either situations or emotional states that are inherently violent and/or

potentially damaging. This was most evident with *erupt,* which encoded a sudden

appearance of something, although not so much with *explode* or any other verb.

Nonetheless, all of these Abstract Undergoers are classified as nominalized events.

(66) A food fight has erupted in New England.

(67) Since the scandal first erupted late last year,...

(68) The black market for caviar exploded.

(69) Middle East gunfighting and its bastard cousin terrorism burst back into our

lives.

The relationship between an argument's semantic type and a specific verb gives us

a glimpse to the components of an explode-verb. However, as we saw with Animate

Undergoers, the semantic categorization of these arguments can be altered depending on

the verb's participation with a particular construction or alternation. This, in turn, can

point to a verb's membership in a separate, but related, verb class. This was especially

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true with the Path Resultatives, which changed a Patient argument to a Theme. Much like how the semantic properties of a verb's arguments reveal information of the class as a whole, so too do diathesis alternations and constructions impact a verb's options (i.e., what class a verb belongs to).

Alternations and Cross-Class Relations

The diathesis alternations and constructions involved with explode-verbs pattern similarly to those present in the break-verbs class. However, because the verbs that comprise the explode-class are also members of other classes, alternations and constructions not found with change-of-state verbs will also be possible. Although these verbs participate in many alternations and constructions, I will be discussing those constructions that are necessary and sufficient in distinguishing the explode-verb class from others. I also aim to show the conflict that arises when verbs participate in certain alternations that are dependent on a shift of verb sense (e.g., *blast* as a change-of-state verb vs. *blast* as a verb of sound emission).

Explode-Verbs as Change-of-State Verbs. Explode-verbs are considered to be, at their basic-level, change-of-state verbs. The basis of this classification lies largely on the semantic aspect of these verbs, primarily that explode-events do produce a change of state on a given object or patient. It is from this basic sense that explode-verbs "branch-out" into other verb classes.

Causative/ Inchoative Alternation

All verbs, with the exception of *blast* and *go supernova*, participate in the causative/ inchoative alternation. The only restriction placed on verbs that can participate

in this alternation is the semantic type of the causative argument. In other words, an internally-caused verb such as *erupt* will be restricted to either Abstract or Nature causers when found in the causative. This stands in contrast with externally-caused verbs which have little restrictions in terms of the causer argument (McKoon & Macfarland, 2000; Wright, 2000). As an exception, *blast* is the only externally caused verb that occurs with the causative, but not the inchoative form.

(70a) The army blasted the compound.

(70b) *The compound blasted. ["compound" = Patient]

The verb *go supernova* also fails to participate in this alternation, although this is due to the verb's inability to be found in the transitive. As discussed in the section concerning the representation of explode-verbs, *go supernova* cannot take a causative interpretation because it is simply the verb *go* with a resultative noun attached to it. Thus, any restrictions placed on the verb *go* in regards to causatives and agents also apply to the verb phrase *go supernova*.

(71) The star went supernova.

(72) *Internal pressure went supernova the star.

Instrument/ Subject Alternation

As shown in the representation of explode-verbs, externally-caused explode verbs can have their causer alternate between an agent and an intermediary instrument. This, however, does not apply to internally-caused verbs such as *erupt* and *go supernova* due to the inability of subject agents to appear with internally-caused verbs in the causative. In addition, the preference for natural/ abstract phenomena acting as causers for internally-

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caused verbs also plays a role in stymieing the appearance of Instrument Subjects.

Because of these two reasons, no intermediary instrument (or any instrument for that

matter) can surface as a subject, as the wielder for such an instrument cannot be

construed to exist, as shown in Sentences (76a) and (76b).

(73a) The men exploded/ blew up the building with a bomb.

(73b) The bomb exploded/ blew up the building.

(74a) The terrorists detonated the bomb with a remote control.

(74b) A remote control detonated the bomb.

(75a) The soldiers blasted the compound with heavy artillery.

(75b) Heavy artillery blasted the compound.

(76a) *The man erupted the crowd with a loudspeaker.

(76b) *The loudspeaker erupted the crowd.

Middle Alternation

Participation in the middle alternation has already been shown to be a part of

change-of-state verbs in Levin (1993), and thus it should be expected that all explode-

verbs are capable of participating in this alternation. However, recall that the middle

alternation involves the patient of a sentence acting as the subject of the sentence, in

addition to having an unexpressed, but understood agent, and a lack of specific time

frame (Levin, 1993, p. 26). The problem with this definition comes when we take into

consideration internally-caused verbs that do show participation in the middle alternation,

but do not entail a volitional agent, seen in examples (77a) and (77b)[10]. The most agent-

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10 Although an externally-caused verb, *blast* is resistant to this particular alternation due to its inability to
    appear in an unaccusative (and thereby, intransitive) form.

like arguments internally-caused verbs have are those that refer to a natural or abstract force. This may indicate that "unexpressed causer" would be a more fitting description, and would allow us to sidestep notions of volition and agency. Nonetheless, a search in COCA resulted in no tokens of *erupt* or *go supernova* in the middle alternation. A separate search on Google also failed to produce any valid tokens of internally-caused verbs participating in the middle alternation.

(77a) The man blew up the buildings.

(77b) The buildings blew up easily.

(78a) The volcano erupted magma.

(78b) Magma erupts easily from a volcano.

The acceptability of *erupt* in the middle alternation is a controversial topic. An informal survey had English speakers gauge the acceptability of Sentence (77b) in the middle alternation, which resulted in all participants agreeing that it was acceptable. However, there was a feeling amongst all speakers that, although acceptable, *erupt* was not the best choice for the given action, with some participants stating that *flow* was the ideal verb. The choice of *flow* to describe this scene is interesting because it encodes a sense of directed motion, and not any of the extended senses of *explode* (appearance and sound emission).

Resultative Construction

The resultative can be divided into two types: property and path (also known as Directional Constructions). It is unique in that no one preposition or word is indicative of this construction (Goldberg, 2004); it can take the form of a post-verbal adjective or

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prepositional phrase, whose preposition can also vary. Because of this, the resultative is

taken to be a family of different constructions, all indicating a resulting state or path

(Goldberg, 1991; Goldberg, 2004).

Property Resultative

When alternating with change-of-state verbs, the property resultative specifies the

result of this change of state. This contrasts with a simple assertion of change of state

when alternating with non-change-of-state verbs. Explode-verbs allow both adjectival

and PP resultatives, although the former is restricted in terms of specific adjectives.

These resultative adjectives are often related in some way to an explode-event, whether in

color *(gold, red)*, direction (*high*) or state of integrity (*open, loose*). Unlike with other

verbs, these adjectives are not found in the comparative, although they can be graded for

degree, as shown in parenthesis.

(79) The bottle dropped and smashed, and the pool and tunnel mouth exploded

(bright) red and gold. [COCA]

(80) The object popped/ burst/ exploded (way) high in the sky.

(81) The police blasted the door (wide) open.

There was no clear division between externally-caused and internally caused

explode verbs. A search of the COCA resulted in *erupted* collocating only with the

directional *high*, and *popped* collocating frequently with directional and state of integrity

adjectives. Conversely, *detonated* and *blew up* did not produce any collocations, nor did

went supernova. However, all verbs could be found with property resultatives that were

in the form of a PP. The verb *burst* was often found in this PP property resultative

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construction, collocating with such PPs as *into flames.*

(82) The thing burst/ popped/ exploded/ blew up/ detonated [into/ to pieces].

(83) The crowd erupted [into glee].

(84) The star went supernova [*open/ *into nothing].

However, the verb *went supernova* would still be incompatible with any property resultative because it is already participating in a resultative construction, where the noun *supernova* acts as the result. The reason for this is due to the fact that property resultatives are not capable of appearing more than once with a verb (Goldberg, 2004). The effect of this would entail two separate but simultaneous resultant states within a single event.

Path Resultative

The path resultative is even more varied, and was found to collocate with most verbs, except *went supernova* and *blow up.* Rarely did the path resultative alternate with *detonate* and *erupt.* An explanation for *went supernova*'s inability to appear with the path resultative may be due to the restriction on multiple result events, however an explanation for the absence of the path resultative with *blow up* and the infrequency of *detonate* and *erupt* remains to be seen.

(85) The man exploded/ burst/ blasted/ popped into the room.

(86) [I]f it had detonated, then it would have detonated into his flak vest. [COCA]

(87) ?The bomb blew up into the park.

(88) Magma that erupts onto the surface is called lava. [GloWbE]

(89) ?The star went supernova onto the surrounding space.

Sentence (87) is problematic (though perfectly grammatical) due to the fact that the sense encoded by the verb and path resultative combination is intuitively more akin to that of appearance-verbs than the standard change-of-state sense that the other four sentences denote. This is similar to speakers' responses to *erupt* in the previously discussed middle alternation, with a sense of directed motion still present. A search of the COCA, where *erupt* was collocated with the directional prepositions *into* or *onto* did not produce any tokens with a change-of-state sense. All tokens of *erupt* plus *into*/*onto* encoded an appearance sense, rather than retaining a semblance of a change-of-state sense.

Participants' responses to resultatives varied in terms of their acceptability, although they did reflect the absence/ infrequency of the previously mentioned verbs. Path resultatives for *blow up*, *detonate* and *go supernova* were deemed to be generally unacceptable. However, *erupt* had an average acceptability score, perhaps indicating that although it is rare, it is not as problematic as the other verbs. The low score of *pop* is rather surprising, due to the fact that *pop* had many instances of path resultatives in the corpora. The reason for this may be due to the arguments of the test sentence, *The pressure popped into his ears*. The unusual pairing of these arguments (and thereby, the scene they refer to) could have distracted participants' attention from the path resultative. Again, this highlights the effect that argument semantics has on the sentence level. Even if a verb allows participation in a given alternation, the semantic roles of the arguments (in this case, *pressure*) in conjunction with the argument of the path resultative (*ears*) may result in conflict. To reiterate, the acceptability scale ranged from [1] being

COMPLETELY UNACCEPTABLE to [5] being PERFECTLY ACCEPTABLE.

Table 15: Sentence Acceptability Scores for Path Resultatives

	Average Scores	Participant Responses
The missile blasted into the bunker.	4.3	20
The new gadget exploded into the market.	4.1	20
The bomb burst through the roof.	4.05	20
The boss erupted into the room.	3.57	19
The gust of wind erupted into the room.	3.45	20
The pressure popped into his ears.	2.73	19
The star went supernova onto the surrounding space.	2.8	20
The teacher went supernova on the student.	2.52	19
The missile blew up into the car.	2.45	20
The bomb detonated onto the bus.	1.95	20

The path resultative refers to a change of location, however the arguments in this sentence give the verb *pop* a sense of change-of-state. Although these verbs are change-of-state verbs at their basic, alternation with the path resultative changes its meaning to a verb of directed motion or one of appearance. However, knowledge of the world influences the realization of resultative structures (Goldberg, 2004), and because pressure has a strong relation to popping, a listener may be conflicted in terms of what is being described. In other words, because *pressure* is not something that undergoes a popping event, but rather causes such an event, the sentence with *pop* was deemed less than acceptable. Therefore, it is expected that the verb *pop* should have a significantly higher

score, if the subject is changed to something that is more aligned to a speaker's real-world knowledge.

The acceptability scores for property resultatives most notably confirmed the inability of *went supernova* from alternating with an average of 2.77 for the PP property resultative. However, across all other verbs, there was a varying degree of participation with the property resultative. All verbs, except *went supernova*, participated in either an adjectival property resultative or one in the form of a PP. In the survey, the PP property resultative was one that referred to a fragmentary result, such as *into pieces*. Although verbs like *explode* and *blow up* were generally acceptable in this particular form of the property resultative (4.9 and 3.47 respectively), *pop* and *erupt* were not (1.9 and 2.25 respectively).

(90) The artillery shell exploded into fragments.

(91) The man blew up into pieces.

(92) The beer can popped to pieces.

(93) The volcano erupted into pieces.

In regards to adjectival property resultatives, *pop* followed by *open* scored very high (4.75), while *explode* with *happy* scored very low (1.75). The importance of this adjectival contrast is that, as mentioned, particular results are constrained by our knowledge of the world. It is expected that *open* would collocate well with explode-verbs due to the fact that such verbs encode an event that releases contained pressure, creating an aperture *(explode open)*. In contrast, emotions, such as *happy*, (provided that they are not in prepositional phrases) do not have a salient semantic relation with

explode-events, even in figurative cases. Not all explode-verbs underwent a detailed evaluation in terms of which property resultatives were acceptable, and such an investigation would need to be conducted in order to fully survey these nuances, as they provide information into what can and cannot occur during an explode-event. In addition, a verb's preference for either an AP or PP property resultatives ought to be investigated as well.

Explode-Verbs as Verbs of Sound Emission. Although explode-verbs are taken to be at their core change-of-state verbs, the various characteristics of an explode-event allow for the verbs themselves to appear in alternations and constructions that do not focus on nor mention the resulting change of state. The following alternations highlight the significant syntactic changes that explode-verbs undergo when they are extended from their basic change-of-state sense to a sound-emission sense.

Conative

The lack of participation in the conative is a hallmark of all change-of-state verbs. Because these verbs entail a resulting state, it is impossible to have situations where a change of state occurs and simultaneously fails to produce a result. However, some explode-verbs do participate in this alternation albeit in the sense of sound emission. Recall that the conative involves the patient object of a transitive sentence being subordinated to the preposition *at*, changing the sentence type from transitive to intransitive (*I shot the buck* becomes *I shot at the buck*). During this alternation, the meaning of the sentence changes from the successful execution of the action on the patient, to one that is dubious in its intended result (a dead or wounded buck). As a

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result, the conative gives the impression that an action was attempted but failed to meet its objective.

For the explode-verbs, *blast*, *blow up*, and *explode*, we see this alternation when the scene described is one of harsh criticism or anger. This does not work well with *detonate* and *burst*, although these verbs do encode a degree of harsh criticism or directed anger when followed by the preposition *at*. The following examples from the COCA involve the explode-verb plus the preposition *at*. For the following sentence pairs, the first sentence has the conative sentence denoting the sharp criticism that is related to the sound-emission sense. The second sentence has the *at* preposition omitted, in order to highlight the difference in sense from sound-emission to change-of-state.

(94a) [The] half-hour show […] blasts at liberals. [COCA]

(94b) The half-hour show blasts liberals. [modified]

(95a) Every time he feels Tycho is getting in the way, he blows up at him.

(95b) Every time he feels Tycho is getting in the way, he blows him up.

(96a) Guillen has exploded at his team several times this season after stinging
     losses.

(96b) Guillen has exploded his team several times this season after stinging
     losses.

This effect is awkwardly present even with the internally-caused verbs *erupt* and *go supernova*, although the transitive variant is problematic due to issues of agency and transitivity that have already been addressed. This restriction may explain the inability of *burst* to fully participate in the conative alternation.

(97a) *The teacher erupted/ went supernova the student.

(97b) ?The teacher erupted/ went supernova at the student.

Patient Omission

The patient of a change-of-state verb is very important in order to successfully understand such a resulting change. Without this argument, we would be at a loss as to what is occurring, making the patient mandatory for change-of-state verbs in English. However, the verb *blast* does allow for the omission of the Patient/ Theme when it is construed in a literal sense as a verb of sound emission, rather the figurative sense of criticism.[11] In these instances, it refers to iterative or habitual events. In addition, the missing patient must be construed as either being indefinite and general, or derived from the meaning of the verb/ context (Goldberg, 2000).

(98a) The stereo blasted music all night.

(98b) The stereo blasted all night.

The patient omission section of the survey involved special directions that instructed participants to treat the subject of each sentence as an unaffected agent or instrument rather than as a patient. These arguments mostly referred to human participants, although for *blast* and *pop* instruments were the causers of the act. In essence, the verbs were supposed to be interpreted as describing a change-of-state but with no overt patient to undergo said change. Internally-caused explode-verbs were left out of this section because of their overwhelming preference for inchoative interpretations and, in the case of *erupt*, a preference for natural causers. Again, the rating scale ranges from [1] being COMPLETELY UNACCEPTABLE to [5]

11 Also as a Verb of Contact by Impact, specifically like a hit-verb (Levin, 1993, pp. 149-150).

PERFECTLY ACCEPTABLE.

Table 16: Patient Omission Acceptability Scores for Externally-Caused Verbs

	Average Scores	Participant Responses
blast	4.1	20
pop	3.4	20
detonate	2.45	20
blow up	2.26	19
burst	1.95	20
explode	1.8	20

(99) The speakers blast furiously.

(100) The pin pops without notice.

(101) Police blow up frequently.

(102) Bomb squads detonate vigorously.

(103) The agents burst without a warrant.

(104) Soldiers explode without a scratch.

Generally, all externally-caused verbs scored very low in terms of patient omission, with the notable exceptions of *blast* and *pop*. There are two possible explanations for these rather high acceptability ratings. The first is that the usage of instruments as subjects may have led to a diminished interpretation of agency. Because instruments have no volition or animacy, there could be difficulty in assigning responsibility for the event. In other words, because instruments are not the prototypical type of causer, their appearance as a causer can cause a listener to rate such instances as less than ideal. This is similar to what was seen in Table 9, where there was a higher

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preference for Animate Actors, as opposed to Artifact Actors. The second explanation, which may be related to the first, has to do with the fact that there is a non-change-of-state sense involved with these two sentences. For *pop* and *blast*, the extended sense of sound emission is most likely responsible for their high acceptability scores.

Explode-verbs as Verbs of Appearance. The verbs *erupt* and *burst* are listed as verbs of appearance by Levin (1993), in addition to other change-of-state verbs such as *break*. Levin explains this relationship as a complicating factor when it comes to classifying verbs, although she does note that change-of-state verbs that also act as verbs of appearance are at their core change-of-state verbs. This "dual membership" arises from a figurative extension from this core (Levin, 1993, p. 259). The following alternations that I will discuss not only show the difference between change-of-state and appearance explode-verbs, but also how these appearance explode-verbs differ from other appearance-verbs, whose basic sense does not encode a change of state.

Causative Alternation

Although not all verbs of appearance participate in the causative alternation, those that do are usually verbs that are at their core change-of-state verbs. These verbs that have an underlying change-of-state revert back to this basic sense when they appear in the causative (Levin, 1993, p. 259). However, there also seems to be a requirement for a path resultative to collocate with the explode-verb (or any verb), if the verb is to be interpreted as an appearance-verb.

(105a) The magician appeared out of nowhere. [Intransitive]

(105b) *The magician appeared the dove out of nowhere. [Transitive]

(106a) The man burst into the room. [Appearance]

(106b) The man burst the balloon. [Change of State]

There-Insertion

This particular alternation involves adding the adverb *there* at the beginning of a sentence and the movement of the subject argument to a post-verbal position, the post-verbal subject itself characterized as being indefinite. In addition, such constructions often have a prepositional phrase (*from it*) which indicates source of action. A search of the COCA , produced only single tokens for e*rupt, blast,* and *burst.* Whereas *erupt* and *pop*'s participation in the alternation can be explained by their additional participation in the appearance-verb class, as per Levin (1993), *blast*'s participation stems from a sound-emission sense; the alternation being found in both verb classes.

(107) ...there burst into view a bright unsettling place of long-legged

mannequins... [COCA]

(108) [S]uddenly there erupted a Blaze of Light from the East. [COCA]

(109) Lilli opened the freezer, and there blasted from it a cold so dense... [COCA]

Locative-Inversion

Although most appearance verbs participate in this alternation, explode-verbs do not show the same ability in having their locative phrases be placed at a pre-verbal position. The only instances given in the COCA are those that have a NP preceding the locative phrase, making the locative phrase subordinate to the preceding NP. It is likely that appearance-verbs that encode a change-of-state at their core do not participate in this alternation.

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(110a) … regional fighting in Zaire erupted.

(110b) *In Zaire, erupted regional fighting.

(111a) A molasses tank in Boston burst in 1919.

(111b) *In 1919 in Boston, burst a molasses tank.

Adjectival Perfect Participle

Although, explode-verbs that alternate as verbs of appearance do surface as adjectival perfect participles, their retention of this appearance-verb sense depends on the noun. Sentences (112) and (114) encode change-of-state senses, while (113) only refers to an appearance-verb sense. This shift in senses seems to be available to *erupt*, as *burst* only appears to encode a change of state event, as can be seen with the unacceptable interpretation in sentence (115).

(112) an erupted volcano[12] [Change of State] [Google]

(113) erupted teeth [Appearance] [COCA]

(114) burst pipes [Change of State]

(115) *burst agents [Appearance]

Chapter Five - Discussion

In the previous chapter, I listed the various features and possibilities that explode-verbs possess, which can be used as evidence for their promotion as a single verb class under the change-of-state class. In order to determine whether such a class is warranted, it is important to ascertain whether all eight verbs are similar enough to be grouped together. Although verbs should bear strong similarities in terms of their linguistic

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12 This could also be interpreted in an appearance-verb sense, if the volcano in question is newly formed and surfacing from the ocean.

capabilities, it is not necessary for all verbs to be perfectly uniform. Neither syntax nor semantics can act as a "final arbiter" of class membership (i.e., what verb can/ cannot be a member of a given class), although common meaning appears to play a greater role in comparison to syntax (Levin, 2009, February). After verifying the final set of verbs, this collection must be compared and contrasted with other established classes, in this case, with other change-of-state verbs.

Revised Membership of Explode-Verbs

The following is a review of the alternations and constructions that explode-verbs can participate in. Because all explode-verbs are at their basic change-of-state verbs, alternations that are characteristic of sound-emission and appearance-verbs are not listed. This is due to the fact that these senses are merely metaphorical extensions of the change-of-state class; the events they represent being merely epiphenomenal to an explode-event.

Table 17: Alternation Participation of Explode-Verbs (Change of State)

Alternation	blast	blow up	burst	detonate	erupt	explode	go supernova	pop
Caus./ Incho.	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Middle	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Instrum./ Subject	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Property Resultative	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Path Resultative	Yes	No	Yes	Rarely	Yes	Yes	No	Yes
Adj. Perf. Participle	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Zero-related Nominal	Yes	No	Yes	No	No	No	No	Yes

Based on these alternations and constructions, *go supernova* is the only verb that must be excluded from the explode-verb class. The many restrictions it has make it far too different in terms of syntactic features, even though its meaning is similar to the other verbs. The next, weakest verb would be *blast* because of its inability to participate in the causative/ inchoative and middle alternations. However, because it shares other features and maintains similarity in meaning, I would still retain this verb as a member of the explode-verb class. It is interesting to see that an internally-causative verb such as *erupt* would still be capable of remaining in the class, namely because all of the other explode-verbs are externally-caused.

Phrasal Verb Alternations and Class Membership

From the initial set of eight explode-verbs, *blow up* and *go supernova* were the only verbs that involved more than one word (i.e., they are phrasal verbs). In the revision of the initial collection of explode-verbs, *go supernova* was eliminated because it did not participate in the same alternations as the other members. This difference stems primarily from *go supernova*'s status as an unergative verb with an accompanying property resultative. As such, it cannot appear in a causative alternation, even if the causer is a natural Actor, due to its unergativity. This forces its sole argument to be a patient, due to the accompanying property resultative's requirement of a shared patient argument (Goldberg, 1995; Goldberg, 2004). In addition, the presence of a property resultative prevents other property resultatives from appearing. The overall result of these properties is that *go supernova'*s syntactic characteristics prevent it from participating in many alternations.

A somewhat similar effect is seen with the verb *blow up*, whereby the particle's presence inhibits participation in some alternations, namely the path resultative and the adjectival past participle. The basic verb *blow* does not encode a change-of-state in and of itself, until the particle *up* is added to the verb. Because of this, it is expected that *blow up* ought to also be merely a verb with an attached resultative. However, the following examples highlight the ambiguity that arises with *up*.

(116a) The wind blew up her skirt.

(116b) The wind blew her skirt.

(116c) *The wind blew up her skirt into the air.

Here, the particle changes the aspect of *blow* from activity to active accomplishment (*blow up*), thereby making this an example of compositional phrasal verbs. A characteristic of this type of phrasal verb is that the particle is not a necessary component for the retention of verb meaning, as seen in Sentence (116b), where the particle is omitted and the general meaning of the event is still retained (Machonin, 2008). In sentence group (116), *up* is used as a path resultative to specify the direction of the action. The fact that this is acting as path resultative is made more apparent by the incompatibility of *up* with another path resultative, in this case *into the air*. However, these characteristics are not present in the next sentences, where the particle is necessary for the verb's meaning to be retained.

(117a) The man blew up the car

(117b) ?The man blew the car.

(117c) ?The man blew up the car into the air.

In contrast to sentence group (116), the situation that is encoded in Sentence (117) is not an activity, but rather an achievement/ causative achievement. Sentence (117b) illustrates the change of meaning of the sentence, when the particle is removed. This is in stark contrast to what was seen in sentence (116b) and further highlights the difference between the two variants of the verb *blow up*. While the activity variant of *blow up* is merely the verb *blow* with an optional particle, the explode-verb variant of *blow up* has this particle lexicalized to the main verb.

The result of this particle becoming integral to the accompanying verb is that it inhibits the participation of the explode-verb *blow up* in the path resultative and the adjectival past participle alternations. In the case of path resultatives, it is possible that the particle is still interpreted as some sort of directional marker that inhibits the collocation of a path resultative within the same sentence. For the adjectival past participle, this mismatch stems from the fact that the participle does not readily modify the accompanying NP because of this particle, producing instances which are anomalous at best and ungrammatical at worst .

(118a) ?The blown up artillery shell.

(118b) *The blown artillery shell up.

The examples shown above illustrate how even moving the particle after the NP still does not produce a grammatical form. The overall effect of particles is that they may prevent phrasal verbs from aligning with other verbs based on syntactic alternations. However, such syntactic incongruities should not disqualify a phrasal verb from class membership, if the verb in question shares multiple alternations with other members,

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shared alternations which allow the encoding of a highly similar event. This is generally why *blow up* is still considered to be a viable member of the explode-verb class, in contrast to *go supernova*.

Explode-Verbs and Other Change-of-State Classes

Across all change-of-state verb classes, explode-verbs generally pattern the closest to both break-verbs and other alternating change-of-state verbs, both in terms of alternations, and in terms of their meaning. With both classes, the ability to participate in the causative/ inchoative was a defining characteristic, even though a minority of verbs did not allow the inchoative component. A second defining alternation was participation in the property resultative construction, which allows the change of state inference to be further specified. However, both alternations merely confirm that explode-verbs are change of state verbs. It does not address whether the class ought to exist as an independent class, as opposed to the current layout of appearing under the class of Other Alternating Change of State Verbs.

Because the event described by explode-verbs involves a compromising of the material integrity of an object, it would be expected that explode-verbs be a type of subordinate class of break-verbs. After all, they do pattern almost identically in terms of alternations and verb aspect. However, I argue against this subordination on the basis that break-events entail a different way of affecting objects. Whereas break-events typically affect a single object, there is no sense of collateral change. This is not the case with explode-verbs, which can involve either damage to a single object or damage to the intended target and the area surrounding the target.[13]

13 Although, we can imagine instances where breaking an object results in someone else being affected

In regards to Other Alternating Change-of-State verbs, the sheer diversity of verbs in this class may warrant a re-classification of all verbs. Thus, the explode-verb class is an attempt at this re-organization of verbs. This approach stems from the fact that although verbs across the Other Alternating Change-of-State class do pattern similarly in terms of alternations, the semantic aspects of the class are not similar enough. In other words, this class may be too coarse-grained as it stands. While Levin (1993) does categorize them in terms of morphology, the semantic aspect is not always consistent within classes, with the notable exception of change-of-color verbs.

Explode-Verbs as a Change-of-State Class

Rather than standing as an independent verb class, explode-verbs must be subsumed under the macro-class of change-of-state verbs. This new class would behave as a sister-category to other change-of-state sub-classes, such as the break-class. In this respect, the difference between this class and the break-class would be minute, given that both classes share the same change-of-state alternation patterns. However, because explode-verbs metaphorically extend to other verb classes, such as the appearance and sound-emission classes, it is apparent that there are syntactic-semantic differences between them. In other words, because explode-events can refer to change-of-state, sound-emission, and appearance events, their semantic nature is sufficiently different from break-events. The preceding sections highlight the fact that the ability to alternate similarly allows the proposed class of explode-verbs to be sufficiently similar to be inducted as a change-of-state subclass. In addition, it is the combination of extended

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(e.g., *I broke the chair, causing you to fall*), such events are not considered to be typical of break-events, in contrast to explode-events.

metaphorical senses and the literal change-of-state sense that further distinguish explode-verbs from other highly similar verb classes, such as the break-class.

Furthermore, a similar grouping of explode-events can be found in FrameNet Project (Fillmore & Baker, 2001). Rather than grouping verbs according to meaning and alternations, FrameNet categorizes verbs (and other content words) into distinct semantic frames. Because of this, verbs that would differ substantially in terms of alternation participation would still be grouped into a single frame class. This preference for semantic, rather than syntactic, criteria allows classes to be less abstract than Levin's (1993) verb classes. The result is that Levin's (1993) classes can vary in comparison to FrameNet's frame classes; some verb classes might be narrower than their frame class counterparts, others could be wider or roughly equal to each other (Baker & Ruppenhofer, 2002). Although FrameNet's focus is on semantics, the fact that explode-events are clearly distinguished from other events highlights a semantic need for a distinct explode-verb class in a Levin (1993) or Levin-like verb classification system. The result of admitting the explode-verb class into such a system would be one way of making the already existing verb classes less abstract, and further refining the already large Other Alternating Change-of-State (Baker & Ruppenhofer, 2002). Such an inclusion would make the proposed class of explode-verbs necessary (or at least, helpful) for a verb classifying system as a whole.

Because explode-verbs pattern alike in terms of syntax and semantics, and because there is precedent of such a class in another lexical database, a verb class system would benefit from the inclusion of an explode-verb class, an inclusion that is mostly

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motivated by semantic reasons. Levin (2009) points out that classes arranged according to their semantic content produce finer-grained classes, while those based around alternations result in coarser-grained classifications (p.2). The former yields more major classes and sub-classes than the latter, and shows that a class based mostly on syntactic similarities, proves to be too unwieldy. In other words, explode-events are semantically distinct from break- and cook-events, even though they are syntactically similar.

Chapter Six - Conclusion

To reiterate, explode-verbs are at their core change-of-state verbs, which encode a sudden violent release of force exerted on a patient. This sense is often extended to denote appearance or sound emission, characteristics that are epiphenomenal to the aforementioned release of pressure and resulting product. They range in force from the seemingly innocuous *pop* to the destructive *explode*. In terms of constructional alternations, they generally participate in the causative/ inchoative and resultative. Where they vary is not only in the force that they encode, but also in regards to the distribution of Actors and Undergoers, ranging from human beings to volcanoes. This is, in turn, influenced by the type of causation, whether internal and external. Even with such a variety, the explode-verb class is still similar enough in terms of syntax and semantics to warrant inclusion as a verb class, primarily subordinate to the Change-of-State macro-class.

In reaching this conclusion, I also indirectly shed light into the challenges that arise when one proposes to group verbs into a class. The most obvious is the inclusion and exclusion of verbs into a potential class, as seen with the verb phrase *go supernova*.

Although verbs in a class are similar in terms of the event that they encode, simple synonymy is not always sufficient to allow membership into a class. Besides selecting candidates for a class, the issue of dissecting senses can also be problematic for any prospective class. Multiple-class membership merely illustrates the versatility and complexity that is characteristic of language and the real-world. As such, it is important to consider whether it is possible to nicely delineate verbs across senses and alternations, and whether such things are even desirable. In addition, the lack of a uniform approach in deciding which alternation ought to be used to distinguish verbs is problematic for anyone grouping verbs. If we attempt to implement such clear-cut delineations, we run the risk of over-simplifying the relationship amongst verbs and classes. These relationships are, in a way, polysemy made manifest, regardless of any problems of classification that may arise.

Although much has been discussed in terms of this set of verbs, this is merely a preliminary report on explode-events. Further research may be directed at the specific distribution of property resultatives across verbs, which can be useful in understanding the nature of events. Another line of subsequent research can also look at verbs that I like to refer to as ballistic-verbs. Verbs such as *shell*, *bombard*, and *mortar* can be viewed as explode-verbs of manner, in contrast to the explode-verbs of result that are the subject of this thesis. It would be interesting to see how this verb group compare and contrast with Levin's (1993) Verbs of Throwing and Verbs of Contact by Impact classes.

References

Baker, C. F., & Ruppenhofer, J. (2002). FrameNet's Frames vs. Levin's Verb Classes. In Proceedings of the *28th annual meeting of the Berkeley Linguistics Society*, 27-38. Berkeley Linguistics Society, Berkeley, CA.

Davies, M. (2008-). *The Corpus of Contemporary American English: 450 million words, 1990-present*. Available online at http://corpus.byu.edu/coca/.

Davies, M. (2007-). *TIME Magazine Corpus: 100 million words, 1920s-2000s*. Available online at http://corpus.byu.edu/time/.

Davies, M. (2013). *Corpus of Global Web-Based English: 1.9 billion words from speakers in 20 countries*. Available online at http://corpus2.byu.edu/glowbe/.

Goldberg, A. E. (1995). *Constructions.* Chicago: University of Chicago Press.

Goldberg, A. E. (2001). Patient arguments of causative verbs can be omitted: The role of information structure in argument distribution. *Language Sciences, 23*, 503-524. Retrieved from http://search.proquest.com.libaccess.sjlibrary.org/docview/85537025?accountid=10361

Goldberg, A. E., & Jackendoff, R. (2004). The english resultative as a family of constructions. *Language, 80*, 532-568. Retrieved from http://search.proquest.com.libaccess.sjlibrary.org/docview/85612786?accountid=10361

Google. *Google*, n.d. Web. 2 Aug. 2013.

Grimshaw, J. (1993). Semantic structure and semantic content in lexical representation. New Brunswick, NJ: Rutgers University, MS.

Fillmore, C. J. (1977). The case for case reopened. In P. Cole & J. Sadock (eds.), *Syntax and Semantics 8: Grammatical Relations*, 59–81. New York: Academic Press.

Fillmore, C. J., & Baker, C.F. (2001). Frame semantics for text understanding. *Proceeding of WordNet and Other Lexical Resources Workshop.* NAACL.

Frense, J., & Bennett, P. (1996). Verb alternations and semantic classes in english and german. *Language Sciences, 18*(1–2), 305-317. doi:http://dx.doi.org.libaccess.sjlibrary.org/10.1016/0388-0001(96)00022-8

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: University of Chicago Press.

Levin, B. (1993). *English verb classes and alternations.* University of Chicago Press.

Levin, B. (2009, February). *Where do verb classes come from?* [Handout]. Verb Typologies Revisited: A Cross-linguistic Reflection on Verbs and Verb Classes, Ghent University, Ghent, Belgium.

Levin, B., & Rappaport Hovav, M. (1995). *Unaccusativity: At the syntax-lexical semantics interface.* MIT.

Levin, B., & Rappaport Hovav, M. (2010). Lexicalized scales and verbs of scalar change. Retrieved from http://www.stanford.edu/~bclevin/cls10change.pdf

Machonis, P. A. (2008). Disambiguating phrasal verbs. *Lingvisticae Investigationes, 31*(2), 200-212. Retrieved from http://search.proquest.com.libaccess.sjlibrary.org/docview/85686436? accountid=10361

Majid, A., Bowerman, M., Staden, M. v., & Boster, J. S. (2007). The semantic categories of cutting and breaking events: A crosslinguistic perspective. *Cognitive Linguistics, 18*(2), 133-152. doi:http://dx.doi.org.libaccess.sjlibrary.org/10.1515/COG.2007.005

McKoon, G., & Macfarland, T. (2000). Externally and internally caused change of state verbs. Language, 76(4), 833-858. Retrieved from http://www.jstor.org.libaccess.sjlibrary.org/stable/417201

Mufwene, S. S. (1978). English Manner-of-Speaking Verbs Revisited. In *Papers from the Parasession on the Lexicon*, 278-289. Chicago Linguistic Society, Chicago, IL.

Pinker, S. (1989). *Learnability and Cognition: The Acquisition of Argument Structure*. Cambridge, MA: MIT Press.

Van Valin, R. D. Jr. (2005). *Exploring the syntax-semantics interface*. Cambridge University.

Van Voorst, J. G. (1995). The Semantic Structure of Causative Constructions. *Studies in Language*, 19, 489-523.

Wheeler, R. S. (1996). Will the real search verbs please stand up? *Papers from the Regional Meetings, Chicago Linguistic Society, 32*(1), 393-407. Retrieved from http://search.proquest.com.libaccess.sjlibrary.org/docview/85542777? accountid=10361

Wright, S. K. (2000). Internally caused and externally caused change of state verbs. *Dissertation Abstracts International, A: The Humanities and Social Sciences,* Retrieved from http://search.proquest.com.libaccess.sjlibrary.org/docview/85566899? accountid=10361

Appendix A: Sample Survey

Agreement to Participate in Research

Responsible Investigator(s): <u>Antonio Hernandez (Student)</u>

Title of Study: <u>Verbs of Explosion as an English Verb Class</u>

1. You have been asked to participate in a research study investigating the behavior of verbs of explosion in terms of their semantic (word-meaning) and syntactic (grammatical usage) nature.

2. The survey is comprised of two sections. For the first section, you will be asked to read over a set of sentences and grade them in terms of their acceptability from (1) being Unacceptable to (4) being Unquestionably Correct. You will deem the level of acceptability of a given sentence using your own intuition and knowledge of the English language. For the second section, you will rate eight verbs in terms of their intensity based on your own knowledge of English. Intensity in this case refers to how destructive or powerful the action of a given verb describes.

3. In the course of answering this survey, you as a participant will not be at any risk of harm or discomfort.

4. In the course of this survey, you will not experience any direct benefits

5. Although the results of this study may be published, no information that could identify you will be included. It is possible that Surveymonkey.com[14] collects the IP addresses and email addresses of survey participants. However, for the purposes of this survey, collection of IP addresses and email addresses will be disabled.

6. There is no compensation for participating in this investigation.

7. Questions about this research may be addressed to the responsible investigator, Antonio Hernandez, at (408) 960-3116 or via e-mail at <u>antonio.d.hernandez@sjsu.edu</u>. Complaints about the research may be presented to: Swathi M. Vanniarajan, Ph.D., Department Chair, Linguistics & Language Dev., College of Humanities and the Arts at (408) 924-3742. Questions about a research subjects' rights, or research-related injury may be presented to Pamela Stacks, Ph.D., Associate Vice President, Graduate Studies and Research at (408) 924-2427.

8. No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose not to participate in the study.

9. Your consent is being given voluntarily. You may refuse to participate in the entire study or in any part of the study. You have the right to not answer questions you do not wish to answer if If you decide to participate in the study, you are free to withdraw at any time without any negative effect on your relations with San Jose State University.

10. Please keep a copy of this form for your own records. By agreeing to participate in the study, it is implied that you have read and understand the above information. Please do not write any identifying information on the survey/questionnaire.

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14 The actual service used was Fluidsurveys.com. However, this change was made after my application to IRB was approved.

Things to keep in mind

- Judge the acceptability of each sentence from (1) being COMPLETELY UNACCEPTABLE to (5) being PERFECTLY ACCEPTABLE. The numbers inbetween are supposed to serve as a gradient between these two extremes.

−   There is no right or wrong answer. Simply use your own intuition to determine the level of acceptability of a given sentence.

English Experience

Please indicate your perceived level of competence of English. For all intents and purposes, 'second language' also includes cases where English is your third or fourth language.

- First Language
- Second Language (+10 years)
- Second Language (6-10 years)
- Second Language (5 years or less)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

For these sentences, please assume the subject of the sentence is unharmed/ unaffected by the action. Example: The police officer detonated (but nothing happened to her).

Police blow up frequently.

               (1)   (2)   (3)   (4)   (5)

Water erodes slowly.

               (1)   (2)   (3)   (4)   (5)

A tiger's teeth cut gruesomely.

               (1)   (2)   (3)   (4)   (5)

Heat burns thoroughly.

               (1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

For these sentences, please assume the subject of the sentence is unharmed/ unaffected by the action. Example: The police officer detonated (but nothing happened to her).

The pin pops without notice.

	(1)	(2)	(3)	(4)	(5)

Cooks chop repeatedly.

	(1)	(2)	(3)	(4)	(5)

Bomb squads detonate vigorously.

	(1)	(2)	(3)	(4)	(5)

The agents burst without a warrant.

	(1)	(2)	(3)	(4)	(5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY
ACCEPTABLE.

*For these sentences, please assume the subject of the sentence is unharmed/
unaffected by the action. Example: The police officer detonated (but nothing
happened to her).*

Chefs dice carefully.

        (1)   (2)   (3)   (4)   (5)

Soldiers explode without a scratch.

        (1)   (2)   (3)   (4)   (5)

Lumberjacks chop without danger.

        (1)   (2)   (3)   (4)   (5)

The speakers blast furiously.

        (1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The potatoes rotted into mush.

(1)　　　　(2)　　　　(3)　　　　(4)　　　　(5)

The beer can popped open.

(1)　　　　(2)　　　　(3)　　　　(4)　　　　(5)

The man blew up with anger.

(1)　　　　(2)　　　　(3)　　　　(4)　　　　(5)

The audience exploded happy.

(1)　　　　(2)　　　　(3)　　　　(4)　　　　(5)

The flower withered into nothing.

(1)　　　　(2)　　　　(3)　　　　(4)　　　　(5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The house burned to ashes.

        (1)   (2)   (3)   (4)   (5)

The conversation deteriorated into insults.

        (1)   (2)   (3)   (4)   (5)

The star went supernova into gas.

        (1)   (2)   (3)   (4)   (5)

The water froze solid.

        (1)   (2)   (3)   (4)   (5)

The bottle shattered to pieces.

        (1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The crowd erupted with glee.

                    (1)   (2)   (3)   (4)   (5)

The artillery shell exploded into fragments.

                    (1)   (2)   (3)   (4)   (5)

The man wilted into despair.

                    (1)   (2)   (3)   (4)   (5)

The toy broke into pieces.

                    (1)   (2)   (3)   (4)   (5)

The metal corroded into pieces.

                    (1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The volcano erupted into pieces.

(1)   (2)   (3)   (4)   (5)

The bomb blew up in pieces.

(1)   (2)   (3)   (4)   (5)

The man went supernova with anger.

(1)   (2)   (3)   (4)   (5)

The beer can popped to pieces.

(1)   (2)   (3)   (4)   (5)

The ice sculpture melted into a puddle .

(1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The bomb detonated onto the bus.

(1)   (2)   (3)   (4)   (5)

The cook cut into the meat.

(1)   (2)   (3)   (4)   (5)

The flames burned into the room.

(1)   (2)   (3)   (4)   (5)

The diver burst out of the water.

(1)   (2)   (3)   (4)   (5)

The star went supernova onto the surrounding space.

(1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The bomb burst through the roof.

(1)   (2)   (3)   (4)   (5)

The bullet tore into the flesh

(1)   (2)   (3)   (4)   (5)

The ball broke through the window.

(1)   (2)   (3)   (4)   (5)

The boss erupted into the room.

(1)   (2)   (3)   (4)   (5)

The spy faded into the shadows.

(1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The waves swelled onto the pier.

| (1) | (2) | (3) | (4) | (5) |

The building collapsed onto the street.

| (1) | (2) | (3) | (4) | (5) |

The gust of wind erupted into the room.

| (1) | (2) | (3) | (4) | (5) |

The missile blew up into the car.

| (1) | (2) | (3) | (4) | (5) |

The pressure popped into his ears.

| (1) | (2) | (3) | (4) | (5) |

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The teacher went supernova on the student.

(1)   (2)   (3)   (4)   (5)

The missile blasted into the bunker.

(1)   (2)   (3)   (4)   (5)

The new gadget exploded into the market.

(1)   (2)   (3)   (4)   (5)

The acid corroded into the hull.

(1)   (2)   (3)   (4)   (5)

The wind eroded into the rock.

(1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The baseball broke the window.

(1)   (2)   (3)   (4)   (5)

The humidity rotted the body.

(1)   (2)   (3)   (4)   (5)

The volcano erupted molten lava

(1)   (2)   (3)   (4)   (5)

The news went supernova the man.

(1)   (2)   (3)   (4)   (5)

The appliance froze the water.

(1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The gardener bloomed the flowers.

| | (1) | (2) | (3) | (4) | (5) |

The demolition team blew up the old house.

| | (1) | (2) | (3) | (4) | (5) |

The cook melted the cheese.

| | (1) | (2) | (3) | (4) | (5) |

The bomb squad exploded the device.

| | (1) | (2) | (3) | (4) | (5) |

The tank exploded the building.

| | (1) | (2) | (3) | (4) | (5) |

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY ACCEPTABLE.

The sun blossomed the flower.

(1)   (2)   (3)   (4)   (5)

The scandal eroded the public's trust.

(1)   (2)   (3)   (4)   (5)

The acid corroded the sink.

(1)   (2)   (3)   (4)   (5)

The immense pressure went supernova the star.

(1)   (2)   (3)   (4)   (5)

The terrorist erupted the car.

(1)   (2)   (3)   (4)   (5)

Please rate each sentence from (1) COMPLETELY UNACCEPTABLE to (5) PERFECTLY
ACCEPTABLE.

The news went supernova the man.[15]

| | (1) | (2) | (3) | (4) | (5) |

The winemaker fermented the grapes.

| | (1) | (2) | (3) | (4) | (5) |

The meteorite exploded the countryside.

| | (1) | (2) | (3) | (4) | (5) |

The air rusted the iron gate.

| | (1) | (2) | (3) | (4) | (5) |

The internal pressure erupted the volcano.

| | (1) | (2) | (3) | (4) | (5) |

15 Duplicated Question

Based on your own knowledge of English, classify the intensity of the verbs with (1) being WEAKEST and (5) being STRONGEST.

	1	2	3	4	5
to explode					
to blow up					
to detonate					
to burst					
to blast					
to erupt					
to go supernova					
to pop					

Appendix B Participant Responses (Patient Omission)

	[1]	[2]	[3]	[4]	[5]	Average Scores	Total Responses
Police blow up frequently.	6	7	3	1	2	2.26	19
Water erodes slowly.	3	4	1	5	7	3.45	20
A tiger's teeth cut gruesomely.	1	8	1	3	7	3.35	20
Heat burns thoroughly.	0	5	7	5	3	3.3	20
The pin pops without notice.	2	6	2	2	8	3.4	20
Cooks chop repeatedly.	0	2	2	3	13	4.35	20
Bomb squads detonate vigorously.	6	5	6	0	3	2.45	20
The agents burst without a warrant.	9	6	3	1	1	1.95	20
Chefs dice carefully.	0	0	1	4	14	4.68	19
Soldiers explode without a scratch.	10	5	4	1	0	1.8	20
Lumberjacks chop without danger.	1	3	3	9	4	3.6	20
The speakers blast furiously.	1	2	4	5	8	4.1	20

Appendix C: Participant Responses (Property Resultatives)

	[1]	[2]	[3]	[4]	[5]	Average Scores	Total Responses
The potatoes rotted into mush.	0	0	1	1	18	4.85	20
The beer can popped open.	0	0	1	3	16	4.75	20
The man blew up with anger.	0	1	2	4	12	4.42	19
The audience exploded happy.	0	0	3	3	14	4.55	20
The flower withered into nothing.	0	0	1	1	18	4.85	20
The house burned to ashes.	1	1	0	3	15	4.5	20
The conversation deteriorated into insults.	1	1	0	3	15	4.5	20
The star went supernova into gas.	5	5	6	4	0	2.45	20
The water froze solid.	1	2	1	1	15	4.35	20
The bottle shattered to pieces.	0	1	2	2	15	4.55	20
The crowd erupted with glee.	1	1	0	2	16	4.55	20
The artillery shell exploded into fragments.	0	0	0	2	18	4.9	20
The man wilted into despair.	0	2	2	7	8	4.1	19
The toy broke into pieces.	0	0	0	1	19	4.95	20
The metal corroded into pieces.	1	1	5	4	9	3.95	20
The volcano erupted into pieces.	5	7	6	2	0	2.25	20
The bomb blew up in pieces.	0	4	6	5	4	3.47	19
The man went supernova with anger.	5	6	4	2	0	2.17	17
The beer can popped to pieces.	10	5	2	3	0	1.9	20
The ice sculpture melted into a puddle .	0	1	1	1	17	4.7	20

Appendix D: Participant Responses (Path Resultatives)

	[1]	[2]	[3]	[4]	[5]	Average Scores	Total Responses
The bomb detonated onto the bus.	9	7	2	0	2	1.95	20
The cook cut into the meat.	1	2	1	2	14	2.95	20
The flames burned into the room.	2	5	4	4	4	3.15	19
The diver burst out of the water.	0	2	2	2	13	4.36	19
The star went supernova onto the surrounding space.	2	9	3	3	3	2.8	20
The bomb burst through the roof.	1	0	3	9	7	4.05	20
The bullet tore into the flesh	1	0	0	2	17	4.7	20
The ball broke through the window.	1	1	0	3	15	4.5	20
The boss erupted into the room.	3	3	2	2	9	3.57	19
The spy faded into the shadows.	0	1	1	2	16	4.89	20
The waves swelled onto the pier.	0	0	3	7	9	4.31	19
The building collapsed onto the street.	0	0	1	4	15	4.7	20
The gust of wind erupted into the room.	1	5	4	4	6	3.45	20
The missile blew up into the car.	5	9	1	2	3	2.45	20
The pressure popped into his ears.	4	6	3	3	3	2.73	19
The teacher went supernova on the student.	6	6	2	1	4	2.52	19
The missile blasted into the bunker.	0	1	3	5	11	4.3	20
The new gadget exploded into the market.	0	2	2	8	8	4.1	20
The acid corroded into the hull.	0	4	2	7	7	3.85	20
The wind eroded into the rock.	6	5	2	4	3	2.65	20

	[1]	[2]	[3]	[4]	[5]	Average Scores	Total Responses
The baseball broke the window.	1	0	1	0	18	4.7	20
The humidity rotted the body.	1	3	0	3	13	4.2	20
The volcano erupted molten lava	0	1	0	5	13	4.57	19
The news went supernova the man.	18	2	0	0	0	1.1	20
The appliance froze the water.	3	1	3	2	11	3.85	20
The gardener bloomed the flowers.	12	6	1	1	0	1.55	20
The demolition team blew up the old house.	0	0	1	1	18	4.85	20
The cook melted the cheese.	1	0	0	1	18	4.75	20
The bomb squad exploded the device.	2	2	3	3	10	3.85	20
The tank exploded the building.	2	5	6	2	5	3.15	20
The sun blossomed the flower.	10	3	2	3	2	2.2	20
The scandal eroded the public's trust.	0	2	0	2	15	4.52	19
The acid corroded the sink.	0	0	2	3	15	4.65	20
The immense pressure went supernova the star.	17	2	1	0	0	1.2	20
The terrorist erupted the car.	14	3	2	0	1	1.55	20
The news went supernova the man.[16]	18	2	0	0	0	1.1	20
The winemaker fermented the grapes.	1	1	1	3	14	4.4	20
The meteorite exploded the countryside.	6	6	4	2	2	2.4	20
The air rusted the iron gate.	1	0	1	8	10	4.3	20
The internal pressure erupted the volcano.	3	5	2	4	6	3.25	20

16 Duplicated Question

Appendix F: Participant Responses (Perceived Intensity of Explode-Verbs)

	[1]	[2]	[3]	[4]	[5]	Average Scores	Total Responses
to explode	0	1	3	6	9	4.21	19
to blow up	0	1	7	9	3	3.7	20
to detonate	1	2	5	5	7	3.75	20
to burst	1	7	9	3	0	2.7	20
to blast	2	1	1	10	6	3.8	20
to erupt	0	2	4	8	6	3.9	20
to go supernova	3	0	3	0	14	4.1	20
to pop	10	6	3	0	1	1.8	20