Reclassification of Non-alternating Locative Verbs in English

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ABSTRACT

This study investigates non-alternating locative verbs in English, and reclassifies them on the basis of two English corpora – COCA and GloWbE – which were chosen because of their interface design, database design, and architecture. Considering that Pinker's classification was presented in 1989 but was based on the English used before 1989, the data from COCA (1990-2012) suits this research purpose better as it is being used to contrast. GloWbE was released in 2013 and contains data for 2012-2013. The corpus is a good platform to access authentic language sources currently in global use. The following questions are explored in this research: (1) Have the non-alternating locative verbs been used in previous classifications (Pinker, 1989; Levin, 1993)? (2) What type of verbs and how many verbs change their classes? (3) Is it possible to present a revised classification of locative verbs in English? This study showed that 10 verbs changed their classes, from the ground-only to the alternating verb class. Based on these results, a revised classification of non-alternating locative verbs was created.

Keywords: non-alternating locative verbs, reclassification, corpus, COCA, GloWbE

1. Introduction

Locative verbs are related to putting an entity in a location in some manner (Levin, 1993). Among locative verbs, non-alternating locative verbs are defined as the following by Pinker (1989): content-oriented verbs cannot merely specify the movement of a theme to a goal location but must specify some particular manner of causation or motion; likewise, container-oriented verbs must not merely specify a change of state in a final scene but must specify what that state is. Otherwise, these verbs would all be synonymous with other verbs such as *put* and *fill* or *cover*.

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Consider the following examples:

(1) Content-oriented non-alternating form

    a. John poured water into the cup. → Figure-only verb

    b. *John poured the cup with water.

(2) Container-oriented non-alternating form

    a. John filled the cup with water. → Ground-only verb

    b. *John filled water into the cup.

<div align="right">(Pinker, 1989: 310)</div>

In (1), the *water* corresponding to Figure (content) of the sentence appears as the direct object of the verb, whereas the *cup* corresponding to the Ground (container) is not allowed in the direct object position. On the contrary, as shown in (2), when *water* corresponds to the Figure of the sentence, it is located in the direct object position, which sentence is unacceptable. That is, the verb *pour* is allowed to take only Figure argument as its direct object and the verb *fill* is allowed to take only Ground argument as its direct object. If the verb accepts only one form, either content-oriented form or container-oriented form, the verb is classified as a non-alternating locative verb.

However, a small number of verbs cannot work as they were intended to be used. The following sentence can be a counter-example that is not used as it is intended.

(3) Scott recalls challenging Greg to **emblazon** Gagwear's logo **on** his skin.[1]

    The verb *emblazon* is classified as a non-alternating container verb in terms of semantic behavior. That is, this verb is used only as a Ground verb. The verb takes only a container entity as a direct object and only can be used in the

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1) Source information: COCA
   Date 2002
   Publication information Vol. 24 Issue 11, p109, 26p, 1c
   Title THE INC 500 List 2002.
   Source Inc.

   Expanded context:
   Cannella # 4% of the Inc. 500 founders surveyed hired CEOs to replace themselves 13% of the Inc. 500 CEOs surveyed said they have been involved in patent litigation BRAND OF BROTHERS # Take two ambitious guys (competitive brothers, no less), fuel them with a couple of cocktails, and unleash them on Los Angeles's Sunset Strip. What do you get? Tattoos. The year was 1996, and Scott and Greg Alterman of apparel company Gagwear (#430) were at their first big trade show. "Slightly buzzed, **"Scott recalls challenging Greg to emblazon Gagwear's logo on his skin**. The deal: Scott would get the same tattoo, and he would even go first -- but if Greg chickened out, he would owe Scott $10,000. Both followed through: Scott's tattoo is on his back, Greg's is on his leg. Today Greg suggests that the tattoos demonstrate fidelity -- to both brother and business.

with construction. However, *emblazon* is used as a Figure verb, as shown in (3), and as a result, it can be used in a both constructions, the *into/onto* and *with* form.

Likewise, the discordance between existing classification assorted by Pinker in 1989 and authentic material observed by empirical researches is revealed. In order to address these limitations, every non-alternating locative verb will be investigated with two corpora. Through this process, a verb can be verified as to whether it has been used as it is intended by the previous classification. Accordingly, based on the data and analysis, a revised classification of non-alternating locative verbs will be presented.

2. Previous Researches

The locative alternation has received lots of attention, mostly about the mechanisms for classifying the locative verbs. There are two mainstream classifications which were done by the syntactic and semantic perspectives.

2.1. Syntactic Classification of Non-alternating Locative Verbs

Locative verbs are part of the category of verbs of putting (Croft, 1991; Dixon, 1991; Gruber, 1976; Jackendoff, 1985; Levin and Rappaport, 1988). Levin (1993) proposed an analysis of English verbs according to multiple types of alternations. Each verb can be described by the set of alternations it undergoes. In her preliminary observation, there is enough correlation between semantic factors and syntactic behaviors to form verb classes. She has defined about 200 verb classes, where, in each class, verbs share similar semantics and a certain number of alternations[2]).

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2) Alternations
  (i) Causative Alternation
    a. Tamara poured water onto the plants.
    b. Water poured onto the plants.
  (ii) Middle Alternation
    a. Tamara poured water onto the plants.
    b. *Water pours easily onto the plants.
  (iii) Conative Alternation
    a. Tamara poured water into the bowl.
    b. *Tamara poured at water into the bowl.

Among more than 200 verb classes above, 5 verb classes correspond to locative verbs that are targeted in this study. Each verb class can be described and characterized by the allowance of alternations. The total number of locative verbs is around 160 and the class names are as following: *Pour* Verbs, *Coil* Verbs, *Funnel* Verbs, *Spray/Load* Verbs and *Fill* Verbs. Those verbs refer to putting an entity in some location in some manner. Among those of five types of verb classes, four classes correspond to the non-alternating locative verbs[3].

Table 1. Non-alternating verb class (Levin, 1993)

Pour Verbs + *Coil* Verbs + *Funnel* Verbs	Dribble, drip, pour, slop, slosh, spew, spill, spurt, coil, curl, loop, roll, spin, twirl, twist, whirl, wind, bang, channel, dip, dump, funnel, hammer, ladle, pound, push, rake, ram, scoop, scrape, shake, shovel, siphon, spoon, squeeze, squish, squash, sweep, tuck, wad, wedge, wipe, wring
Fill Verbs	Adorn, anoint, bandage, bathe, bestrew, bind, blanket, block, blot, bombard, carpet, choke, cloak, clog, clutter, coat, contaminate, cover, dam, dapple, deck, decorate, deluge, dirty, douse, dot, drench, edge, embellish, emblaze, encircle, encrust, endow, enrich, entangle, face, festoon, fill, fleck, flood, frame, garland, garnish, imbue, impregnate, infect, inlay, interlace, interlard, interleave, intersperse, interweave, inundate, lard, lash, line, litter, mask, mottle, ornament, pad, pave, plate, plug, pollute, replenish, repopulate, riddle, ring, ripple, robe, saturate, season, shroud, smother, soak, soil, speckle, splotch, spot, staff, stain, stipple, stop up, stud, suffuse, surround, swaddle, swathe, taint, tile, trim, veil, vein, wreathe

(ⅳ) Coreferential interpretation of pronouns
    a. Tamara poured the water over her.
(ⅴ) Zero-related Nominal
    a. a spill

3) Verb classes and Alternations (Levin, 1993)

	Pour Verbs	*Coil* Verbs	*Funnel* Verbs	*Spray/Load* Verbs	*Fill* Verbs
Locative Alternation	*	*	*	o	*
Causative Alternation	o	o	*	o/*	*
Middle Alternation	*	o	*	–	–
Conative Alternation	*	*	*	o (some verbs)	–
Coreferential Interpretation of Pronouns	o	o	–	o (some verbs)	–
Zero-related Nominal	o (few verbs)	o	o (some verbs)	o (some verbs)	–

The members of the set of *Pour* Verbs cannot undergo a locative alternation. Based on the research of Anderson (1971, 1977), Carter (1988), Dixon (1989) Larson (1990), Jeffries and Willis (1984), Levin (1993) classified a total of seven words as the member of this class: dribble, drop, pour, slosh, spew, spill, spurt. All of these verbs relate to putting entity - usually liquids - on surfaces or in containers.

Coil Verbs have the same syntactic patterns as the *Pour* Verbs in a locative alternation. they don't need to be separated from the perspective of locative alternation, even in this study. Only the semantic feature is different between the two types in this research scope. Contrary to the entity of *Pour* Verbs construction, the one in *Coil* Verbs construction is not liquids but strings and usually used with the preposition *around* because of its meaning. This class contains nine verbs in Levin's research (1993): coil, curl, loop, roll, spin, twirl, twist, whirl, wind.

Funnel Verbs usually involve putting entities in spatially confined locations. These verbs show a preference for *into* rather than *in* and for *onto* rather than *on*. 26 verbs are included in this class: bang, channel, dip, dump, funnel, hammer, ladle, pound, push, rake, ram, scoop, scrape, shake, shovel, siphon, spoon, squeeze, squish, squash, sweep, tuck, wad, wedge, wipe, wring.

Fill Verbs are only found in the *with* construction and these verbs cannot undergo locative alternation. A few verbs in this type allow alternation *with* and *in*. When a sentence includes all of elements, one figure argument, one ground argument, one preposition and a proper verb, it can be considered within the this research scope. Besides Gawron (1983, 1986), Hall (1965), Jolly (1987), they (Levin & Rappaport, 1988; Rappaport & Levin, 1992) created a list of this type of content. The number of the verbs in this class is 95.

2.2. Semantic Classification of Non-alternating Locative Verbs

The locative verbs are classified according to the semantic features, which is based on the lexical rules. Pinker (1989: 49) claimed that the locative verbs denote a transfer of substance or set of objects (the theme, content of locatum) into or onto a container or surface (the goal, container, or location). The locative constructions taking the preposition *into or onto* are labeled content-oriented or theme-object forms, and those taking the preposition *with*, named container-oriented or goal-object forms, respectively.

142 locative verbs were compiled according to the semantic cohesiveness and they formed fourteen subclasses. The targeted 142 verbs in the Pinker's research were put

together with the verbs that were collected by Rappaport and Levin (1985) and those that he heard and read for several years while working on his research (Pinker, 1989).

109 non-alternating locative verbs are also divided into two categories. They are 33 content-oriented verbs and 76 container-oriented verbs, respectively.

Table 2. Non-alternating locative verbs by Pinker (1989)

Content-oriented or into/onto verbs (Non-alternating)		
Name of Class	Features	Verbs(N=33)
Non-alternating. 1 (N = 10)	A mass is enabled to move via the force of gravity.	Dribble, drip, drizzle, dump, ladle, pour, shake, slop, slosh, spill,
Non-alternating. 2 (N = 6)	Flexible object extended in one dimension is put around another object.	Coil, spin, twirl, twist, whirl, wind
Non-alternating. 3 (N = 8)	Mass is expelled from inside an entity.	Emit, excrete, expectorate, expel, exude, secrete, spew, vomit
Non-alternating. 4 (N = 9)	Verbs of attachment	Attach, fasten, glue, nail, paste, pin, staple, stick, tape
Container-oriented or with verbs (Non-alternating)		
Name of Class	Features	Verbs(N=76)
Non-alternating. 5 (N = 19)	A layer completely covers of surface.	Fill, cover, pave, occupy, bandage, face, flood, deluge, douse, inundate, blanket, coat, encrust, inlay, pad, plate, shroud, smother, tile, line, edge
Non-alternating. 6 (N = 22)	Addition of object an abject or mass to a location causes an aesthetic or qualitative, often evaluative, change in the location	Pollute, adorn, burden, infect, season, endow, trim, clutter, deck, dirty, embellish, emblazon, enrich, festoon, garnish, imbue, litter, ornament, replenish, soil, stain, taint
Non-alternating. 7 (N = 15)	A mass is caused to be coextensive with a solid or layer-like medium	Drench, interlace, soak, infuse, interlard, interleave, intersperse, interweave, lard, ripple, vein, impregnate, saturate, stain, suffuse
Non-alternating. 8 (N = 12)	An object or mass impedes the free movement of, from, or through the object in which it is put	Block, plug, lash, choke, clog, dam, stop up, bind, chain, entangle, lasso, rope
Non-alternating. 9 (N = 8)	A set of objects is distributed over a surface	Bombard, blot, dapple, riddle, speckle, splotch, spot, stud

2.3. Comparison between Two Previous Classifications

In this section, the classifications that were previously classified, in terms of the syntactic and semantic perspective, are compared. Syntactic classification was researched by Levin in 1993 and semantic classification was done by Pinker in 1989. Each class of verbs are included in Table 3 for the comparison.

Table 3. Levin's & Pinker's classification of non-alternating locative verbs

	Levin's classification	Pinker's classification
Figure-only verbs	**Dribble, drip, pour, slop, slosh,** spew, **spill,** spurt, **coil,** curl, loop, roll, **spin, twirl, twist, whirl, wind,** bang, channel, dip, **dump,** funnel, hammer, **ladle,** pound, push, rake, ram, scoop, scrape, **shake,** shovel, siphon, spoon, squeeze, squish, squash, sweep, tuck, wad, wedge, wipe, wring (n = 43)	**Dribble, drip,** drizzle, **dump, ladle, pour, shake, slop, slosh, spill, coil, spin, twirl, twist, whirl, wind,** emit, excrete, expectorate, expel, exude, secrete, spew, vomit, attach, fasten, glue, nail, paste, pin, staple, stick, tape(n = 33)
Ground-only verbs	**Adorn,** anoint, **bandage,** bathe, bestrew, **bind, blanket, block, blot, bombard,** carpet, **choke,** cloak, **clog, clutter, coat,** contaminate, **cover, dam, dapple, deck,** decorate, **deluge, dirty, douse,** dot, **drench, edge, embellish,** emblaze, encircle, **encrust, endow, enrich, entangle, face, festoon, fill,** fleck, **flood,** frame, garland, **garnish, imbue, impregnate, infect, inlay, interlace, interlard, interleave, intersperse, interweave, inundate, lard, lash, line, litter,** mask, mottle, **ornament, pad, pave, plate, plug, pollute, replenish,** repopulate, **riddle,** ring, **ripple,** robe, **saturate, season, shroud, smother, soak, soil, speckle, splotch, spot,** staff, **stain,** stipple, **stop up, stud, suffuse,** surround, swaddle, swathe, **taint, tile, trim,** veil, **vein,** wreathe (n = 95)	**Fill, cover, pave,** occupy, **bandage, face, flood, deluge, douse, inundate, blanket, coat, encrust, inlay, pad, plate, shroud, smother, tile, line, edge, pollute, adorn,** burden, **infect, season, endow, trim, clutter, deck, dirty, embellish,** emblazon, **enrich, festoon, garnish, imbue, litter, ornament, replenish, soil, stain, taint, drench, interlace, soak,** infuse, **interlard, interleave, intersperse, interweave, lard, ripple, vein, impregnate, saturate, suffuse, block, plug, lash, choke, clog, dam, stop up, bind,** chain, **entangle,** lasso, rope, **bombard, blot, dapple, riddle, speckle, splotch, spot, stud** (n = 77)

In Figure-only verbs, the results of the two research are not consistent. Different reasons may be raised about this inconsistency. Even *wad* is classified as a Figure only verb in Levin's classification, but it is classified as an alternating verb in Pinker's classification. *Drizzle* and *stick* are Figure-only verbs in Pinker's classification, but they are alternating verbs in Levin's classification. Those kinds of verbs have shade backgrounds[4]. It might be just misclassified or they had a little different research scope and limit because of different viewpoints of the locative verbs. Therefore, in

this study the overlapping verbs are included in the research scope. 15 verbs are overlapping between Levin's and Pinker's classification, which are expressed in bold type.

In Ground-only verbs, one verb falls into a different classification. According to Levin, *Bestrew* is classified as a Ground-only verb, which has shade background, but it is an alternating verb in Pinker's classification. 70 verbs are overlapping between two classifications. They are target verbs in this research and presented in bold type.

3. Methodology

3.1. Data Collection

In order to verify how locative verbs are used among English speakers, the following corpus engines are used: The Corpus of Contemporary American English (http://corpus.byu.edu/coca/) (hereafter, COCA)[5]) which contains more than 450 million words of full-text data; The Corpus of Global Web-Based English (http://corpus.byu.edu/glowbe/) (hereafter, GloWbE) which is composed of 1.9 billion words from 1.8 million web pages in 20 different English-speaking countries.

Due to the design of each corpus, they are the most suitable corpora to investigate ongoing changes in the language. Especially, considering Pinker's classification was presented in 1989 and it was based on the English before 1989, the data from COCA (1990-2012) fits in well with this research purpose. In addition, GloWbE was released in 2013 and contains the data in 2012-2013. It provides a good opportunity to research authentic language sources currently in global use.

3.2. Analysis Procedures

This study is carried out by 5 steps listed below:
Step 1: Examining Sense and Usage of Verb that are included in both
Step 2: Observing the Corpus Data
Step 3: Computing Figure Precedence Rate
In this step, the results which are collected in step 2 are calculated to present the proportion of how much the Figure arguments take possessions of precedence over

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4) Those verbs will be researched in-depth in the study of alternating locative verbs.
5) The data is regularly updated. It contains more than 520 million words of text at the present moment.

the Ground argument. This numerical figure is a kind of *relative frequency* in statistics. The formula for FPR is below

$$\text{FPR} = \frac{\text{the number of Figure precedence}}{\text{the number of Figure precedence} + \text{the number of Ground precedence}}$$

Step 4: Calculating the confidence interval of the proportion

This research uses the standard error to calculate the confidence interval, which is a range of values likely to include the population mean.

All the locative verbs have different frequencies in sentence use. Therefore, one standard error cannot be applied to all the verbs. Each verb was calculated according to the mathematical formula individually.

A 95% confidence interval for the FPR was calculated.[6]

$$\hat{p} \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \quad = \hat{p} \pm 1.96 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

For example, the FPR of the verb *Flood* in Type 2 indicates 0.182 in COCA, and the number of Figure precedence is 314 and that of Ground preceded sentences is 1409. That is, the total number of sentences used in COCA is 1723.[7]

$$0.182 \pm 1.96 \quad = \sqrt{\frac{0.182 \times 0.818}{1723}} \quad = 0.1638,\ 0.2002$$

Therefore, the confidence interval of *flood* is $0.1638 \sim 0.2002$.

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6) $\hat{p}$: Estimates were calculated from the samples of FPR.
   $Z_{0.025} = 1.96$ (confidence level $(1-\alpha) = 0.95$))

7) Standard Error: $\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}} \ = \sqrt{\dfrac{0.182 \times 0.818}{1723}} \ = \ 0.009295$

   Margin of Error: $\pm Z_{\alpha/2} \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}} \ = \pm 1.96 \times 0.009295 = \pm 0.0182$

   Lower limit: $\hat{p} - Z_{\alpha/2} \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}} \ = 0.182 - 0.0182 = 0.1638$

   Upper limit: $\hat{p} + Z_{\alpha/2} \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}} \ = 0.182 + 0.0182 = 0.2002$

Step 5: Reclassifying the verbs

Based on a numerical value resulting from step 3 and 4, all of the verbs are analyzed and reclassified if necessary.

The FPR of *flood* is 0.182, which falls into the confidence interval. That is, the FPR is significant and the verb should be moved to alternating locative verb class.

4. Results

4.1. Type 1: Figure-only Verbs

There are four classes in the content-oriented non-alternating locative verbs by Pinker (1989) and there are 33. Levin presents 43 verbs in this class. There are 15 target verbs in this study which are overlapping between the two classifications. Any sentence is counted as long as the verb is used as a locative verb and the two arguments can be assigned as Figure and Ground respectively. The verbs of this type tend to be used with the prepositions *on, over, from, around* besides *into* and *onto*. All the verbs have been used as they were intended as seen in the following Table 4.

Table 4. Observation of Figure-only verbs in COCA and GloWbE

Verbs	COCA			GloWbE		
	F prep G	G prep F	FPR	F prep G	G prep F	FPR
Dribble	197	0	1.000	372	0	1.000
Drip	943	0	1.000	1,044	0	1.000
Dump	2,289	0	1.000	5,692	0	1.000
Ladle	424	0	1.000	166	0	1.000
Pour	9,042	0	1.000	18,597	0	1.000
Shake	330	0	1.000	440	0	1.000
Slop	85	0	1.000	120	0	1.000
Slosh	136	0	1.000	90	0	1.000
Spill	2,965	0	1.000	5,883	0	1.000
Coil	80	0	1.000	93	0	1.000
Spin	232	0	1.000	402	0	1.000
Twirl	83	0	1.000	64	0	1.000
Twist	172	0	1.000	238	0	1.000
Whirl	107	0	1.000	90	0	1.000
Wind	394	0	1.000	506	0	1.000

4.2. Type 2: Ground-only Verbs

Five classes are included in this type by Pinker's research and the number is 77. According to Levin, 95 verbs are classified into this category. The number of overlapping verbs between the two classifications is 70 and they are target verbs in this study. All of the sentences are counted as long as the verb is used as a locative verb and the two arguments can be assigned as Figure and Ground respectively. Most of verbs are used with *with,* but some verbs are used with the preposition *in.*

Table 5. Observation of Ground-only verbs in COCA and GloWbE

Verbs	COCA			GloWbE		
	F prep G	G prep F	FPR	F prep G	G prep F	FPR
Deluge	0	193	0.000	0	312	0.000
Douse	0	556	0.000	0	1,082	0.000
Flood	314	1,409	0.182	789	5,254	0.131
Inundate	0	489	0.000	0	489	0.000
Bandage	0	37	0.000	0	63	0.000
Blanket	0	308	0.000	0	440	0.000
Coat	0	2514	0.000	0	3,638	0.000
Cover	0	22,017	0.000	0	63,019	0.000
Encrust	0	215	0.000	0	303	0.000
Face	-	-	-	-	-	-
Inlay	4	3	0.571	28	8	0.778
Pad	0	107	0.000	0	440	0.000
Pave	0	406	0.000	0	68	0.000
Plate	0	46	0.000	0	230	0.000
Shroud	0	54	0.000	0	190	0.000
Smother	0	231	0.000	0	491	0.000
Tile	0	32	0.000	0	107	0.000
Line	0	3,824	0.000	0	7,857	0.000
Edge	0	282	0.000	0	286	0.000
Fill	188	29,118	0.006	479	82,625	0.006
Adorn	0	1,120	0.000	0	3,350	0.000

Table 5. Continued 1

Verbs	COCA			GloWbE		
	F prep G	G prep F	FPR	F prep G	G prep F	FPR
Clutter	0	447	0.000	0	773	0.000
Deck	0	176	0.000	0	548	0.000
Dirty	0	55	0.000	0	204	0.000
Embellish	0	372	0.000	0	914	0.000
Endow	0	1,092	0.000	0	5,543	0.000
Enrich	0	336	0.000	0	1,648	0.000
Festoon	0	419	0.000	0	457	0.000
Garnish	0	1,655	0.000	0	1,065	0.000
Imbue	46	899	0.049	253	2,763	0.084
Infect	0	1,754	0.000	0	6,065	0.000
Litter	0	1,276	0.000	0	3,633	0.000
Ornament	0	115	0.000	0	319	0.000
Pollute	0	159	0.000	0	874	0.000
Replenish	53	83	0.390	239	345	0.409
Season	0	117	0.000	0	324	0.000
Soil	0	95	0.000	0	237	0.000
Stain	0	659	0.000	0	1,142	0.000
Taint	0	222	0.000	0	964	0.000
Trim	0	465	0.000	0	578	0.000
Interlace	0	54	0.000	0	173	0.000
Interlard	0	3	0.000	0	6	0.000
Interleave	0	15	0.000	0	49	0.000
Intersperse	16	599	0.026	8	2,284	0.003
Interweave	97	194	0.333	274	774	0.261
Lard	0	67	0.000	0	112	0.000
Ripple	22	116	0.159	46	59	0.438
Vein	0	55	0.000	0	18	0.000
Drench	0	186	0.000	0	386	0.000
Impregnate	0	138	0.000	0	374	0.000

Table 5. Continued 2

Verbs	COCA			GloWbE		
	F prep G	G prep F	FPR	F prep G	G prep F	FPR
Saturate	0	569	0.000	0	1,744	0.000
Soak	287	451	0.389	475	852	0.358
Stain	0	659	0.000	0	1,142	0.000
Suffuse	0	325	0.000	0	559	0.000
Block	0	443	0.000	0	1,505	0.000
Chock	0	500	0.000	0	806	0.000
Clog	0	378	0.000	0	900	0.000
Dam	0	11	0.000	0	50	0.000
Plug	1,572	192	0.891	5,865	252	0.959
Stop Up	0	3	0.000	0	5	0.000
Bind	0	1,035	0.000	0	4,087	0.000
Entangle	0	163	0.000	0	603	0.000
Lash	0	245	0.000	0	482	0.000
Bombard	0	574	0.000	0	3,228	0.000
Blot	0	154	0.000	0	180	0.000
Dapple	0	58	0.000	0	39	0.000
Riddle	0	791	0.000	0	3,175	0.000
Speckle	0	12	0.000	0	8	0.000
Splotch	0	43	0.000	0	1	0.000
Spot	0	481	0.000	0	1,502	0.000
Stud	0	687	0.000	0	38	0.000

5. Discussion

5.1. Reclassification of Non-alternating Locative Verbs

In this section, the verbs with significant values in FPR are organized. The table shows a verb's frequency, standard error, and confidence interval along with the FPR in both COCA and GloWbE. It indicates which verbs change their classes and how semantic and syntactic changes have taken place in the language.

There is no significant value in type 1. That is, language use of Figure-only verbs has not been changed over time. On the other hand, a few Ground-only verbs in type 2, which are supposed to show 0 in their FPRs, don't work as they were intended. 10 verbs don't have 0 in FPR and one verb has 0 in Frequency as shown in the following Table 6.

Table 6. Significant FPRs in type 2

Verbs	COCA				GloWbE			
	Fre-quency	FPR	SE	Confidence interval	Fre-quency	FPR	SE	Confidence Interval
Flood	1723	0.182	0.0092	0.1638~0.2002	6043	0.131	0.0043	0.1225~0.1395
Face	-	-	-		-	-	-	
Inlay	7	0.571	0.1870	0.2044~0.9376	36	0.778	0.0693	0.6422~0.9138
Fill	29306	0.0064	0.0005	0.0055~0.0073	83104	0.006	0.0003	0.0055~0.0065
Imbue	945	0.049	0.0070	0.0352~0.0628	3016	0.084	0.0050	0.0741~0.0939
Replenish	136	0.390	0.0418	0.3080~0.4720	584	0.409	0.0203	0.3691~0.4489
Intersperse	615	0.026	0.0064	0.0134~0.0386	2292	0.003	0.0011	0.0008~0.0052
Interweave	291	0.333	0.0276	0.2788~0.3871	1048	0.261	0.0136	0.2344~0.2876
Ripple	138	0.159	0.0311	0.0980~0.2200	104	0.438	0.0954	0.3426~0.5334
Soak	738	0.389	0.0179	0.3538~0.4242	1327	0.358	0.0132	0.3322~0.3878
Plug	1764	0.891	0.0074	0.8765~0.9055	6117	0.959	0.0025	0.9540~0.9640

A frequency of 0 means that the verb is no longer used with the meaning of locativization. This verb *face* should be ruled out of the locative verbs. Among the 11 verbs here, 10 verbs should change their class from a Ground-only verb to an alternating verb, which have a shade background.

5.2. A Revised Classification of Non-alternating Locative Verbs

Based on the results of the previous sections, there is not any change in the class members in Type 1. The 10 verbs in Type 2 change their class from the Ground-only verb class to the alternating verb class, and one verb *face* is excluded from the locative verbs, since it is no longer defined by its locativization. The original total number of 70 is reduced to 60 in the Ground-only verb class. 10 verbs[8]) change their class

from the Ground-only verb class to an alternating verb class. That is, the number of alternating verbs in both researchers' classifications has now grown by 10 respectively.[9]

Table 7. A revised classification of Non-alternating locative verbs

Types	Verbs
Figure only verbs (N=15)	Dribble, drip, dump, ladle, pour, shake, slop, slosh, spill, coil, spin, twirl, twist, whirl, wind
Ground only verbs (N=60)	Cover, pave, bandage, deluge, douse, inundate, blanket, coat, encrust, pad, plate, shroud, smother, tile, line, edge, pollute, adorn, infect, season, endow, trim, clutter, deck, dirty, embellish, enrich, festoon, garnish, litter, ornament, soil, stain, taint, drench, interlace, interlard, interleave, intersperse, lard, vein, impregnate, saturate, suffuse, block, lash, choke, clog, dam, stop up, bind, entangle, bombard, blot, dapple, riddle, speckle, splotch, spot, stud

5.3. Comparison of Reclassified Verbs with COHA

It needs be verified how the reclassified verbs were used when the researcher's study was being conducted. They might have just misclassified those verbs in the classification. The Corpus of Historical American English (http://corpus.byu.edu/coha/) (hereafter, COHA) is used for this purpose. COHA is the largest corpus of historical English and allows us to quickly and easily search more than 400 million words of text of American English from 1810 to 2009. As COHA provides findings as a unit over 10-year periods, it can be possible to collect certain periods of data. Thus, the data from 1810 to 2009 was only collected in this study because the period of 1990-2009 overlaps with COCA[10].

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8) fill, flood, inlay, imbue, replenish, intersperse, interweave, ripple, soak, plug

9) ⟨Alternating Locative verbs⟩
   Levin's classification (1993): brush, cram, crowd, cultivate, dab, daub, drape, drizzle, dust, hang, heap, inject, jam, load, mound, pack, pile, plant, plaster, ?prick, pump, rub, scatter, seed, settle, sew, shower, slather, smear, smudge, sow, spatter, splash, splatter, spray, spread, sprinkle, spritz, squirt, stack, stick, stock, strew, string, stuff, swab, ?vest, ?wash, warp (N=49)
   Pinker's classification (1989): brush, dab, daub, plaster, rub, slather, smear, smudge, spread, streak, heap, pile, stack, inject, spatter, splash, splatter, spray, sprinkle, squirt, scatter, sow, strew, pack, cram, stuff, crowd, jam, wad, load, stock (N=31)
   Alternating locative verbs will be investigated along with the verbs which change their class from Ground-only verbs to alternating verbs from both synchronic and diachronic perspectives.

10) NOTE: COHA 1819-2009 (In this study, 1819-1898)
   COCA 1990-2012
   GloWbE 2012-2013

Table 8. FPRs of 10 reclassified verbs in COHA

	F prep G	G prep F	FPR	SE
Flood	56 (into 4, onto 3, on 41, over 8)	1,270 (with 1,270)	0.056	0.012
Inlay	0	7 (with 7)	0.000	0.000
Fill	10 (into 10)	31,157 (with 31,157)	0.000	0.000
Imbue	2 (into 1, in 1)	1,050 (with 1,050)	0.000	0.000
Replenish	1 (into 1)	113 (with 113)	0.000	0.000
Intersperse	35 (into 28, in 7)	753 (with 753)	0.044	0.007
Interweave	27 (into 23, in 4)	469 (with 469)	0.054	0.010
Ripple	1 (into 1)	72 (with 72)	0.000	0.000
Soak	99 (into 99)	292 (with 292)	0.253	0.011
Plug	183 (into 183)	91 (with 91)	0.668	0.028

According to the results of COHA, five verbs fall into alternating verb class: flood, intersperse, interweave, soak and plug in the dark background. Their values are significant, which means they had been used as an alternating verb before Levin and Pinker conducted research. Can we assume that this discrepancy comes from researcher's error that is possibly caused by method of classification such as subjective intuition?

The other five verbs are involved in Ground-only verbs in both COHA's result and previous researchers' classification. It reveals that some of the non-alternating locative verbs definitely changed in their use. That is, syntactic changes have taken place in the language over time.

6. Summary and Concluding Remarks

This research investigates English non-alternating locative verbs, and reclassifies them. Each of these verbs is observed with two corpora: COCA, GloWbE. Thanks to the design of each one, they are the most suitable corpora to investigate current and ongoing changes in the language. The two classifications which were previously researched by Pinker and Levin respectively are fundamentally used for choosing target verbs in the study. The data collected from the two corpora are studied from the perspective of an argument order between Figure and Ground and it reveals that

10 verbs have changed in their syntactic use. All of the verbs are moved from the Ground-only verbs to the alternating verbs and they are reclassified. In addition, the reclassified verbs were investigated with historical language corpus, COHA, because of the possibility that they might have been misclassified by researchers. According to the result of COHA, five verbs had been used as alternating verbs, which makes us assume that researchers may have made errors. However, five verbs are rightly classified and they are empirically proved. That is, they have definitely changed in their syntactic use and it has taken place over time.

This research has been done using an empirical method, corpus. Corpus is a sampling of words and generally considered not ideal for a precise reflection of the human language, which is a common criticism leveled against the corpus. To minimize statistical errors, two corpora are used in the study and also standard error, margin of error, and confidence intervals are calculated for every verb individually in the course of analysis and reclassification. It is worth finding a few examples which do not work as they were intended to be used, which can be evidence that locative verbs have been changing in terms of argument order in a sentence as time passes.

This study reveals that the language has changed in its syntactic use over time. Accordingly, the study presents a revised classification of non-alternating locative verbs. It needs to take a closer look at the direction of movement of the reclassified verbs here. All of the reclassified verbs originally belonged to Ground-only verbs and move to an alternating verb class. They used to be used as a Ground-only verb and considered the argument order as entrenched or preempted. It would be a natural question to ask what factors were involved in this change. Among the factors, what has a fundamental and great effect on this syntactic language change. Addressing this question would be the next research purpose and it would be interesting to ascertain research on other language changes.

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