Compounding in the Slot Structure Model

Carlos Benavides
University of Massachusetts Dartmouth
cbenavides@umassd.edu

1. Introduction

- The semantics of compounding has been one of the most **elusive** undertakings in morphological research. As Jackendoff (2010) points out, scholars have **despaired** at finding the range of possible **relations** (or semantic **functions**) between the constituents of a compound.
- The current paper presents a fully developed model of compound formation, set within the framework of the **Slot Structure Model** (**SSM**) (Benavides 2003, 2009, 2010, 2022), a constraint-based model of morphology that is based on **percolation** of both syntactic and semantic features and on **slot structure**, which organizes the information in the lexical entries of words and affixes.
- The SSM is partly based on the **dual-route model** (Pinker 2006, Pinker 1999, Pinker & Ullman 2002).
- The **goal** of the paper is to demonstrate how the **meaning** of a compound is **built** from that of its constituents, and the **relations** between them, using the SSM framework.

- It is shown that analyzing compound formation using SSM brings with it several **advantages**, including:
- A more **comprehensive** explanation of how the semantics of compounding works
- A principled, more **systematic** way to determine the **headedness** of a compound, regardless of the language
- The ability to explain the **generativity** of compounds on the basis of the actual and potential information contained in the **lexical entries** of the constituents
- And the **simplification** of the **interpretation** of compounds, not only because of the notation, but also due to the structure **inside** the lexical entries involved in the determination of compound meaning.
- Importantly, SSM achieves all this employing the **same machinery** that is already used for derivation, with some **enhancements**, including the **enrichment** of lexical entries, to produce a **flexible**, **generative** mechanism.

- Jackendoff’s (2010) analysis of compounds based on **Conceptual Semantics** is taken as a basis for **comparison**.
- The current paper provides an account for a **wide range** of compound types, including **NN, NA, AN, VN**, and **AA**. The analysis is based **on English, Spanish and German compounds**, but it should be applicable to compounds in other languages.
- The current paper thus achieves a **wider coverage** of the data than other current approaches that deal with the semantics of compounding, including Jackendoff (2009, 2010, 2016) and Toquero-Pérez (2020), and Schlücker (2016).
- **Example compounds** to support the analysis have been obtained from the Corpus del Español (CDE, Davies 2002-), the iWeb corpus (Davies 2018-), Jackendoff (2010), Toquero-Pérez (2020), Lang (2013), Moyna (2011), and Schlücker (2016).
- Examples are shown in § 5.

2. Basic Semantic Functions and Schemas

- Jackendoff (2009, 2010, 2016) presents a list of the most prominent basic functions for English compounds. Toquero-Pérez (2020) made modifications to that list, e.g., by adding the functions PROPER FUNCTION (PF) and ARGUMENT. The combination of the two lists is shown in Table 1.
- According to Jackendoff (2010), these seem rather plausible as functions that are readily available pragmatically. These functions are used in the analysis of compounds in § 5.
- (Note: X is the meaning of N_1, Y is the meaning of N_2.)

Table 1: List of basic functions (adapted from Jackendoff 2016: 27–30 and Toquero-Pérez (2020: 9).

Function	**Paraphrase**	**Example**
CLASSIFY (X_1,Y_2)	‘N_1 classifies N_2’	beta cell Leyden jar
PF (X_1,Y_2)	‘N_2 whose PF is to function as/act N_1’	attack helicopter stew beef
ARGUMENT Y_2(X_1) (Rev.)	‘(a/the) N_2 of/by N_1’	helicopter attack collar size
SIMILAR (X_1,Y_2)	‘an N2 similar to N1’	kidney bean pie chart
KIND (X_1,Y_2) (Rev.)	‘N_1 is a kind of N_2’	pine tree ferryboat
BE (X_1, AT/IN/ON/ Y_2) (LOCATION) (Rev.)	‘N_1 located at/in/on N_2’	lake house inkpad November rain
COMP (X_1,Y_2) (Rev.)	‘N_2 is composed of N_1’	meatball sheet metal
MADE (X_1, FROM Y_2) (Rev.)	‘N_2 made from N_1’	coconut oil rubber tree
PART OF (X_1,Y_2) (Rev.)	‘N_2 is part of N_1’	doorknob wheelchair cinnamon roll
CAUSE (X_1,Y_2)	‘N_2 caused by N_1’	diaper rash sunburn
MAKE (X_1,Y_2) (Rev.)	‘N_1 makes N_2’	spider poison silkworm
SERVES-AS (Y_2, X_1)	‘N_2 that serves as N_1’	guard dog extension cord
HAVE (X_1,Y_2) (Rev.)	‘N_2 that has N_1’	glamour girl gangster money
PROTECT (X_1,Y_2 FROM Z)	‘N_2 protects N_1 from something’	lifeboat flea collar
BE (Y_2,X_1)	‘N_2 is (also) an N_1’	boy king singer-songwriter
BOTH (X_1,Y_2)	‘both N_1 and N_2’	boy king politician-tycoon

- Note that several of these **basic functions**, if not all, can form part of the **core meaning** of **simplex nouns** (and other words), and may sometimes coincide with proper functions.

- For instance, bread is composed of flour (COMP); the basic function PROTECT is the proper function of *shield*; a sedan is a type of car (CLASSIFY); an oak is a KIND of tree; a finger is a PART of a hand; and pheromones are MADE BY some animals.

- This fact is **important** for the analysis of compounding in § 5, because the functions are shown as **embedded** in the **slot structure** of lexical entries, not as part of a schema.

- Schemas

- (1) N-N compound schemata (or constructions) (Jackendoff 2010)
  a. Argument schema: $[N_1\ N_2] = [Y_2\ (..., X_1, ...)]$ ‘a N_2 by/of/... N_1’
  b. Modifier schema: $[N_1\ N_2] = [Y_2^{\alpha}; [\mathbf{F}\ (..., X_1, ..., \alpha, ...)]]$
  ‘an N_2 such that F is true of N_1 and N_2’

- The basic functions and the action modalities can fill in *F* in (1b) to build compound meanings, as in (2).

- (2) a. $\text{window}_1\ \text{seat}_2 = \text{SEAT}_2\ ; [Y_2\ \mathbf{LOC}\ \text{AT WINDOW}_1]$
  b. $\text{felafel}_1\ \text{ball}_2 = \text{BALL}_2; [Y_2\ \mathbf{COMP}\ \text{FELAFEL}_1]$

3. The Slot Structure Model (SSM)

- The SSM is an approach to morphology based in part on **Lexical Conceptual Structure (LCS)** (Jackendoff 1990, 2002, Rappaport & Levin 1988, 1992) that explains the process of [base+affix] **unification** in regular word formation in Spanish (e.g. *demoli+cion* [*demolición* 'demolition']) and other languages, and is crucially based on the notion of **lexical entries** instantiated in a slot structure.

- Crucial to the SSM is that percolation, subcat/select, and slot structure, acting in concert **determine the structure** and content of the **lexical entries** of **derivatives** and allow for **predictions** to be made about the **behavior** of groups of features in the formation of a word.

- Percolation in particular, as shown by Pinker (1999) and Pinker & Ullman (2002), is key to account for **compositionality** in word formation. Huang & Pinker (2010) call percolation ***information-inheritance*** and stress the need for this mechanism in morphology, both in inflection and word formation.

- The **dual-route model** posits that while **regular** forms (e.g. *work+er*, Sp. *completa+mente* ‘completely’) are computed by combinatorial rules, **irregular**, semiproductive, or unpredictable forms (e.g. *strength*, *salut+at+ion* vs. **salut+ion*, Sp. *resoluble* vs. **resolvible* (reg.) ‘solvable’) have to be **memorized** and are stored in a sort of analogical (**associative**, relational) **network** that is a part of the lexicon and implements **lexical redundancy rules**.
- Thus, when speakers hear or produce a complex word, they first attempt to form a derivative via the **regular** route (using SSM principles, see below), but if an **irregular** form already exists for that concept, the regular route is blocked and the **irregular** form **stored** in the lexicon takes over.
- The **search** for the stored form and the operation of the rule work in **parallel**, until one of them “wins.”

3.1. Slot Structure

- Arranging features in a lexical entry in the form of a **slot structure** rather than just listing the features, allows for **predictions** to be made about the **behavior** of groups of features during and after derivation.
- The information contained in lexical items is organized into groups of features that act as information **blocks** that **percolate** as **units** to the branching node.
- The idea of a slot structure containing idiosyncratic information is compatible with the notion of an **LCS**. The **LCS** is the place in the lexical entry of an item where the syntactically relevant **semantic content** of the item is encoded (cf. Rappaport & Levin 1988, Jackendoff 1983, 1990, Speas 1990).

- (6) LCS of *put*

  PUT: $[_{EVENT}$ CAUSE ([THING], $[_{EVENT}$ GO ([THING], [AT [PLACE]])])]

  [adapted from Jackendoff 1990]

3.2. Percolation

- The **Modified Feature Percolation Conventions** proposed involve a **re-definition** of the **features** that are allowed to percolate by **Head and Backup Percolation**, in answer to Lieber's (1992:77) question of "what features percolate, [and] where features are allowed to percolate from."

- Modified Feature Percolation Conventions
  - a. Head Percolation: The affix (the head) percolates its non-subcat/selectional information (i.e. its CATEGORIAL, CORE and ARGUMENT slots and blocks) to the branching node.
  - b. Secondary Percolation: All the information blocks of the base (i.e. the CATEGORIAL, CORE, ARGUMENT, and PARTICIPANT blocks) percolate to the branching node and attempt to occupy slots. Once a slot has been occupied, a percolating information block may occupy that slot as long as it has compatible features (i.e. either morphosyntactic or semantic). If a percolating block does not find an empty or compatible slot, it may not occupy any slots in the output, and is discarded.

- Crucially, a **head** is characterized by the fact that it imposes its categorial features on the output, and affects argument structure by **adding** arguments or contributing to their **suppression**.
- It follows that the **non-head** in a derivative can neither impose its categorial features on the output **nor bring about changes in argument structure.**
- In addition, the notion of head and the mechanism of Head Percolation give rise to the **prediction** that the features of the **non-head** (the base) **cannot override** the features of the head (the affix) in the output.
- Another key **prediction** of SSM is that knowing the slot configuration of the head allows one to **predict** which information blocks of the non-head will **form part** of the output, and which will be **discarded**.

3.3. Derivational Trees

3.3.1. Suppression of Arguments

colar ‘sift': [x CAUSE [y BECOME SIFTED]]

- Tree 1 V > N **-dor**

cola+dor ‘sieve’
1 CATEGORIAL
2,5 CORE

colar ‘sift’	*-dor* ‘instrument’
4 CATEGORIAL [EVENT] [+V, -N]	1 CATEGORIAL [THING] [+N, -V]
5 CORE [+separation] → [+selection]	2 CORE Instrument
	3 SUBCAT/SELECT [EVENT]__ [+V, -N]__ ARGUMENT I
6 ARGUMENT I CAUSE Agent	
7 ARGUMENT II CHANGE OF STATE SIFTED	

- Tree 2 V > N **-ción**

demoli+ción ‘demolition’
1 CATEGORIAL
4 CORE
6 ARGUMENT II

demoler ‘demolish’ | *-ción* ‘action’

demoler ‘demolish’	*-ción* ‘action’
3 CATEGORIAL [EVENT] [+V, -N]	1 CATEGORIAL [ACTION] [+N, -V]
4 CORE [+destroy] →	CORE
	2 SUBCAT/SELECT [EVENT]__ [+V, -N]__
5 ARGUMENT I CAUSE Agent	
6 ARGUMENT II CHANGE OF STATE → DEMOLISHED Theme	ARGUMENT II

3.3.2. Addition Accompanied by Transference of Arguments

- Tree 3 A > V **-izar**

modern+izar ‘modernize’
1 CATEGORIAL
5 CORE
3 ARGUMENT I
6 ARGUMENT II

moderno ‘modern’	*-izar* ‘cause’
<u>4 CATEGORIAL</u> [PROPERTY] [+N, +V]	<u>1 CATEGORIAL</u> [EVENT] [+V, -N]
<u>5 CORE</u> [+recent] → [+new]	<u>CORE</u>
	<u>2 SUBCAT/SELECT</u> [PROPERTY]__ [STATE]__ [+N]__
	<u>3 ARGUMENT I</u> CAUSE Causer
<u>6 ARGUMENT II</u> Modifiee →	<u>ARGUMENT II</u> CHANGE OF STATE

3.3.3. Transference of Arguments

- Tree 4 V > A **-tivo**

crea+tivo ‘creative’
1 CATEGORIAL
4 CORE
5 ARGUMENT I

crear ‘create’

-tivo ‘having the capacity to/having the property of’

3 CATEGORIAL [EVENT] [+V, -N]	1 CATEGORIAL [PROPERTY] [+N, +V]
4 CORE [+produce] → [+innovate]	CORE
	2 SUBCAT/SELECT [EVENT]__ [+V, -N]__ ARGUMENT I
5 ARGUMENT I CAUSE → Agent	ARGUMENT I
6 ARGUMENT II CHANGE OF STATE Th	

- Tree 5 V > A **-ble**

plega+ble ‘foldable’
1 CATEGORIAL
2,5 CORE
7 ARGUMENT II

plegar ‘fold’ *-ble* ‘possibility’

4 CATEGORIAL [EVENT] [+V, -N]	1 CATEGORIAL [PROPERTY] [+N, +V]
5 CORE [+bend] → [+make compact]	2 CORE Possibility
	3 SUBCAT/SELECT [EVENT]__ [+V, -N]__ ARGUMENT I ARGUMENT II
6 ARGUMENT I CAUSE Agent	
7 ARGUMENT II CHANGE OF STATE → FOLDED Theme	ARGUMENT II

3.4. Summary of operations on argument structure

- Suppression of one or more arguments (Trees 1, 2, 4, 5)
- Addition of an argument (by the suffix) (Tree 3)
- ARGUMENT II → ARGUMENT II (Tree 2, 3, 5)
- ARGUMENT I → ARGUMENT I (Tree 4)

- It is important to point out that even though there is **unification** of features as part of the process of percolation, **percolation goes beyond unification**, and allows for some features to **override and suppress** other features, as seen in the derivational trees above.
- While **unification grammars** (Shieber 1986, Hellwig 2004) and **slot grammars** (McCord 1980) have slots for arguments and complements, unlike SSM, they do not have slots for the rest of the information in a lexical entry.
- One of the **key innovations** of SSM is that **all** the information in a lexical entry is **stored in slots**, and these slots percolate and determine the meaning of complex words. In turn, a crucial element of this innovation is that each **argument and its associated subevent** are stored together in a **single slot**, not separated into their own structures (Argument Structure, Event Structure), and these slots percolate during unification.

3.6. Other Affixes, Other Languages

- (7) Nungu i-na-phík-**íts**-a kadzidzi maungu.

Nungu	i-na-phík-**íts**-a	kadzidzi	maungu.
9porcupine	9s-ps-cook-CAUS-fv	1aowl-OBJ	6pumpkins-OBJ

  ‘The porcupine made the owl cook the pumpkins’ [Chichewa; Alsina 1992]

- There is a **single representation** for the causative affix, which contributes a **Causer** and has two other (empty) argument slots, one for ARGUMENT II, which will be specified as storing the **"most affected"** argument (of the base), and one for ARGUMENT III.
- **Pragmatic** factors will determine whether the ARGUMENT I or ARGUMENT II of the base, whichever is **most affected**, will occupy the ARGUMENT II slot (the "most affected" slot) in the output *(the owl)*.
- The other argument of the base, the one that did not occupy the ARGUMENT II slot of the output (*the pumpkins*), will fill the ARGUMENT III slot; the syntax will determine whether that argument will be marked as an oblique, an indirect object or a second object.

Causative suffixes

- Tree 6 V > V Chichewa causative **-íts** (cf. Alsina 1992)

phík+íts-infl 'cause to cook'
1 CATEGORIAL
2,6 CORE
4 ARGUMENT I
7 ARGUMENT II
8 ARGUMENT III

phík 'cook'	*-íts* 'cause'
5 CATEGORIAL [EVENT] [+V, -N]	1 CATEGORIAL [EVENT] [+V, -N]
6 CORE [+transform] → [+apply heat]	2 CORE CAUSE
	3 SUBCAT/SELECT [EVENT]__ [+V, -N]__
7 ARGUMENT I CAUSE → to ARG II Agent	4 ARGUMENT I Causer
8 ARGUMENT II CHANGE OF STATE COOKED → to ARG III Theme	ARGUMENT II Affected
	ARGUMENT III

- (8) Nungu i-na-phík-**íts**-a maungu kwá kádzidzi.

Nungu	i-na-phík-**íts**-a	maungu	kwá	kádzidzi.
9porcupine	9s-ps-cook-CAUS-fv	6pumpkins-OBJ	to	1aowl-OBL

‘The porcupine had the pumpkins cooked by the owl’ [Chichewa; Alsina 1992]

- In this case, in contrast, the **most affected** argument is *the pumpkins* (ARGUMENT II of the base), which goes to the ARGUMENT II slot of the output, while the ARGUMENT I of the base (*the owl*) occupies the ARGUMENT III slot and is marked as an oblique by the syntax.

- Tree 7 V > V Chichewa causative **-íts** (cf. Alsina 1992)

phík+íts-infl 'cause to cook'
1 CATEGORIAL
2,6 CORE
4 ARGUMENT I
8 ARGUMENT II
7 ARGUMENT III

phík 'cook'	*-íts* 'cause'
5 CATEGORIAL [EVENT] [+V, -N]	1 CATEGORIAL [EVENT] [+V, -N]
6 CORE [+transform] → [+apply heat]	2 CORE CAUSE
	3 SUBCAT/SELECT [EVENT]__ [+V, -N]__
7 ARGUMENT I CAUSE → to ARG III Agent	4 ARGUMENT I Causer
8 ARGUMENT II CHANGE OF STATE COOKED → Theme	ARGUMENT II Affected
	ARGUMENT III

Derivational prefixes

- Tree 8 V > V **re-**

re+construir ‘reconstruct’
1 CATEGORIAL
2,5 CORE
3 ARGUMENT I
4 ARGUMENT II

re- ‘repetition’

5 CORE
Repetition →

6 SUBCAT/SELECT
__[EVENT]
__[+V, -N]
__CHANGE OF STATE

construir ‘build’

1 CATEGORIAL
[EVENT]
[+V, -N]

2 CORE
[+create]
[+assemble]

3 ARGUMENT I
CAUSE
Agent

4 ARGUMENT II
CHANGE OF STATE
Theme

- Tree 9 N > A **pro-**

pro+amnistía ‘pro-amnesty’
1 CATEGORIAL
2,6 CORE
4 ARGUMENT I

pro- ‘in favor of’

amnistía ‘amnesty’

1 CATEGORIAL [PROPERTY] [+N, +V]	5 CATEGORIAL [STATE] [+N, -V]
2 CORE Support	6 CORE ← [+pardon]
3 SUBCAT/SELECT __[STATE] __[+N, -V]	
4 ARGUMENT I [+human]	

Inflectional affixes

- Tree 10 Turkish case suffix **-i**

ev+i 'house-ACC'
1 CATEGORIAL
2 INHERENT
4 CASE
3 CORE

ev 'house' | *-i* 'accusative'

ev 'house'	*-i* 'accusative'
1 CATEGORIAL [THING] [+N, -V]	
2 INHERENT [+Count] [+Common]	
CASE	4 CASE ← ACC
3 CORE [+building] [+domestic]	
	5 SUBCAT [+N, -V]__

- Tree 11 Inflectional suffix **-s**

libro+s ‘books’
1 CATEGORIAL
2,4 INHERENT
3 CORE

libro -*s* ‘plural’

1 CATEGORIAL [THING] [+N, -V]	
2 INHERENT [+Count] [+Common]	4 INHERENT ← [+Plural]
3 CORE [+contains information] [+has pages] [+has a cover]	
	5 SUBCAT [+N, -V]__

4. The Generative Lexicon (GL)

4.1. Lexical Entries in GL

- According to Pustejovsky (1995) and Pustejovsky & Ježek (2016), the **qualia** is the mechanism used in GL to represent **the core meaning** of words.
- **Qualia Structure** consists of the following four basic **roles** or dimensions **of meaning** inside lexical items:
- **Formal**: encoding taxonomic information about the lexical item (the "is-a" relation)
- **Constitutive**: encoding information on the parts and constitution of an object ("part-of" or "made-of" relation)
- **Telic**: encoding information on **purpose** and **function** (the "used-for" or "functions-as" relation); according to Jackendoff (2010), the telic quale specifies the **proper function** of an object. In some cases, this role could be equivalent to the basic function SERVES-AS (see Table 1).
- **Agentive**: encoding information about the origin of the object (the "created-by" relation).

- (9) Lexical entry for *car*
- [car
- [QUALIA = F = **vehicle**]
  C = **engine, door, wheels ...**]

- (10) Lexical entry for *letter*

- [letter
- [QUALIA = T = **read**]
                A = **write**]

- (11) Lexical entry for *house*

- [house
- [QUALIA = F = **building**]
                C = **door, rooms, …**]
                T = **live in**]
                A = **build**]

4.2. Compounds in GL

- (12) Lexical entry for *plastic*

- [plastic
- [QUALIA = F = **material**]
  C = **plastic**]

- (13) Lexical entry for *bag*

- [bag
- [QUALIA = F = **container: bag**]
  T = **hold**]

- (14) Lexical entry for *plastic bag*

- [plastic bag
- [QUALIA = F = **bag**]
  C = **plastic**]

5. Compounding in SSM

- As with derivation, **compounding** in SSM occurs via the **unification** of the **constituents** of the compound, with slot structure and percolation playing a key role.
- **Pragmatic** information, **world knowledge** and encyclopedic knowledge are also important factors in determining compound meaning (Jackendoff 2009, 2010), and this is reflected in the SSM analysis.
- For example, what **slots** will be relevant for the selection of a given **proper function** may depend on **pragmatics and context**.
- In Jackendoff’s (2016) account (see also Schlücker 2016), the **schemas** for the basic functions use material from the **internal semantic structure** of the two nouns, but the schemas are separate, **detached** from the lexical entries of the constituents.
- **Schemas** in the Conceptual Semantics approach are a **reflection** or an **abstraction** of what is going on inside lexical entries during compound formation.

- **In contrast**, in SSM the semantics involved in the functions expressed by the schemas are **incorporated** into slot structure, due to the content of the lexical entries of the constituents, as well as the action of **unification** and percolation.
- In SSM the basic functions are **integrated** into the lexical entries of the constituents, and features in slot structure compose with each other.
- In addition, the analysis of compounding in SSM shows that lexical entries as represented in SSM are **flexible**. There is a **template** for lexical entries, but it is **not fixed**; different slots may be used depending on the type of word formation or compounding.
- This flexibility or **elasticity** of slot structure facilitates the **generativity** that characterizes compound formation.
- The flexibility is **not ad hoc**; it is based on the actual and potential slots **already available** in the entries of **simplex** lexical items (e.g. “tree COMP wood”).

- Another **advantage** of the representation of compounding in SSM is that the **interpretation** of the semantics of certain compounds is **less complex** than in a Conceptual Semantics analysis.
- For example, in ***piano bench*** ‘bench on which one sits while playing the piano,’ sitting comes from the proper function of *bench*, and playing comes from the proper function of *piano*.
- These two functions are connected by the basic function of temporal location, ‘while,’ as seen in the schemas in (15-16). Thus, there are three independent components involved in linking N_1 and N_2, two of which come from the proper functions of pianos and benches, and one from a basic function.

- (15) [N_1 N_2] = [Y2α; [Fβ (..., α, ...); [H (β, [G(…X1…))])]] (Jackendoff 2010)

- (16) $piano_1$ $bench_2$ = [BENCH2α; [PF (SITβ (PERSONγ, ON α);
  [BEtempδ (β, AT [*PLAY*ε (γ, [PIANOζ; [PF (PLAYε (PERSON, ζ)]]1))]]]
  ‘a bench on which one sits, such sitting being while one plays a piano (which is what one does with a piano)’

[Jackendoff 2010]

5.1. Diagrams of Compound Formation in SSM

- The diagrams below show how the SSM enables a determination of **headedness** in a **systematic** way based on the **information in the slot structure** of the **constituents**, along with percolation.
- Given that the **head** is the constituent whose entire slot structure percolates, it follows that the **head** is the constituent that **receives** information from the other constituent, to form the compound as a whole.
- Thus, **headedness** in SSM is established by determining what constituent has **contributed the most slots and features** to a compound, which in turn enables an **objective determination** of what compounds are left- or right-headed in any language.
- In a sense, the head is the **repository** of the information for the entire compound, which is a **new** way of viewing **headship**.

5.1.1. NN Compounds

- Diagram 1

plastic	bag
CATEGORIAL [THING] N	**CATEGORIAL** **[THING]** **N**
	CORE **ARTIFACT** **BAG**
	PF **HOLD CONTENT**
CORE MATERIAL PLASTIC →	**COMP** **→ PLASTIC**

Lexical entry for *plastic bag*

1 CATEGORIAL [THING] N
CORE ARTIFACT BAG
PF HOLD CONTENT
COMP PLASTIC

- Diagram 2

ice	bag
CATEGORIAL [THING] N	**CATEGORIAL** **[THING]** **N**
	CORE **ARTIFACT** **BAG**
	PF **HOLD CONTENT**
CORE MATERIAL ICE →	**CONTENT** **→ ICE**

- Diagram 3

Similar: *tren bala* ‘bullet train’

hombre ‘man’	araña ‘spider’
<u>CATEGORIAL</u> **[THING]** **N**	<u>CATEGORIAL</u> [THING] N
<u>CORE</u> **MAN**	
SIMILAR **SPIDER** ←	<u>CORE</u> SPIDER ←

- Diagram 4

attack	helicopter
CATEGORIAL [ACTION] N	**CATEGORIAL** **[THING]** **N**
ARGUMENT I	**CORE** **ARTIFACT** **HELICOPTER**
CORE ATTACK →	**PF** **→ ATTACK**
ARGUMENT II	

- Diagram 5

Similar: *ataque pirata* ‘pirate attack’

helicopter	attack
CATEGORIAL [THING] N	**CATEGORIAL** **[ACTION]** **N**
CORE ARTIFACT HELICOPTER →	**ARGUMENT I** **→ HELICOPTER**
	CORE **ATTACK**
	ARGUMENT II

- Diagram 6

truck	driver
CATEGORIAL [THING] N	**CATEGORIAL** **[THING]** **N**
	CORE **DRIVE-PERSON**
CORE ARTIFACT TRUCK →	**ARGUMENT II** → TRUCK

piano$_1$ bench$_2$ = [BENCH2α; [PF (SITβ (PERSONγ, ON α);
[BEtempδ (β, AT [*PLAY*ε (γ, [PIANOζ; [PF (PLAYε (PERSON, ζ)]]1))]]]

- Diagram 7

piano	bench
CATEGORIAL [THING] N	**CATEGORIAL** **[THING]** **N**
CORE ARTIFACT → PIANO	**CORE** **ARTIFACT** **BENCH**
	PF **PERSON SIT ON**
PF PLAY →	**ACTIVITY** **→ PLAY**
ARGUMENT	**ARGUMENT** **→ PIANO**

5.1.2. AN and NA Compounds

- Diagram 8

tall	glass
CATEGORIAL [PROPERTY] A	**CATEGORIAL** **[THING]** **N**
	CORE **ARTIFACT** **GLASS**
	PF **HOLD CONTENT**
CORE TALL →	**PROPERTY** **→ TALL**
MODIFIEE	**ARGUMENT** **LIQUID**

- Diagram 9

kalt ‘cold’	Start
<u>CATEGORIAL</u> [PROPERTY] A	**<u>CATEGORIAL</u>** **[ACTION]** **N**
	<u>CORE</u> **START**
<u>CORE</u> COLD →	**<u>MANNER</u>** **→ COLD**
MODIFIEE	**<u>ARGUMENT</u>** **MACHINE**

• Diagram 10

schnell ‘fast’	Restaurant
CATEGORIAL [PROPERTY] A	**CATEGORIAL** **[THING]** **N**
	CORE **PLACE** **RESTAURANT**
	PF **SERVE FOOD**
CORE FAST →	**MANNER** → **FAST**
MODIFIEE	

- Diagram 11

cine ‘movies’	mudo ‘silent’
<u>CATEGORIAL</u> **[INFORMATION]** **N**	<u>CATEGORIAL</u> [PROPERTY] A
<u>CORE</u> **CINEMA/MOVIES**	
<u>PROPERTY</u> **SILENT** ←	<u>CORE</u> SILENT ←
	<u>MODIFIEE</u>

- Diagram 12

pelo ‘hair’	rojo ‘red’ (*pelirrojo*)
<u>CATEGORIAL</u> [THING] N	**<u>CATEGORIAL</u>** **[PROPERTY]** **A**
	<u>CORE</u> **RED**
<u>CORE</u> PART BODY HAIR →	**<u>PART</u>** → **HAIR**
	ARGUMENT

5.1.3. VN Compounds

- Diagram 13

jump	rope
CATEGORIAL [ACTION] V	**CATEGORIAL** **[THING]** **N**
ARGUMENT I	**CORE** **ARTIFACT** **ROPE**
CORE JUMP →	**PURPOSE** **→ JUMP**

5.1.4. AA Compounds

- Diagram 14

dark	blue
1 <u>CATEGORIAL</u> [PROPERTY] A	**1 <u>CATEGORIAL</u>** **[PROPERTY]** **A**
	<u>CORE</u> **COLOR** **BLUE**
<u>CORE</u> DARK →	**<u>TONE</u>** **→ DARK**
<u>MODIFIEE</u>	**<u>MODIFIEE</u>**

5.1.5. Multiword Formations (Expressions)

5.1.5.1. Multiple-word Compounds

- Diagram 15

plastic bag	inventory
CATEGORIAL [THING] N	**CATEGORIAL** **[COLLECTIVE]** **N**
CORE ARTIFACT → BAG	**CORE** **GOODS/ITEMS**
PF HOLD CONTENT →	**PF** **USE-SALE**
COMP PLASTIC →	**ARGUMENT** **→ CORE, PF, COMP (of plastic bag)**

5.1.5.2. Prepositional Link Compounds

- Diagram 16

Also multiword expressions: *contaminación por lluvia ácida* ‘acid rain pollution’

casa ‘house’ de ‘of’ campo ‘countryside’

<u>CATEGORIAL</u> **[THING]** **N**	1 <u>CATEGORIAL</u> [PLACE] N
<u>CORE</u> **BUILDING** **HOUSE**	
<u>LOCATION</u> **COUNTRYSIDE** ←	<u>CORE</u> COUNTRYSIDE ←

5.1.5.3. Dual-headed Compounds

- Diagram 17

boy	king
CATEGORIAL [THING] N	**CATEGORIAL** **[THING]** **N**
	CORE **KING**
CORE BOY →	**ALSO** → **BOY**

Exocentric compounds

- Due to **pragmatics**, **context**, and a **metonymic** interpretation, a *lowlife* refers to a kind of person (who leads a low life), not to a kind of life.
- Notice the clear role played by **pragmatics** in the Spanish exocentric compound *lavaplatos* [wash + dishes], which can either mean 'dishwashing machine' or refer to a person who washes dishes (a dishwasher), depending on the **context**.

- In Jackendoff's (2009) analysis, exocentric compounds result from the general schema in (17), based on **metonymy**, where N_1 and N_2 are both arguments of a modifying function *F*. (18) shows an example of how the schema is filled out. Since these are exocentric compounds, the **head** has to be **lexically stipulated**.

- (17) *Exocentric compound schema*: $[N_1\ N_2] = [Z; [F(..., X_1, ..., Y_2, ...)]]$
    - 'something such that F is true of N_1 and N_2'
-
- (18) $bird_1brain_2$ = PERSONα; [SIMILAR ($BRAIN_2$β (α), Fβ ($BIRD_1$)]
  'person whose brain is similar to that of a bird'

6. Conclusion

- This paper has shown that an analysis of compounding that employs the SSM framework brings about several important **advantages**.
- First, it has the ability to explain the **generativity** of compounds on the basis of the actual and potential information **contained** in the lexical entries of the constituents
- It demonstrates a more **systematic** way to **determine** the **headedness** of a compound, regardless of the language
- It enables the **simplification of the interpretation** of compounds, not only of the notation, but also of the structure inside lexical entries involved in determining compound meaning.
- This is done because the information related to the semantic functions is shown in the **context** of the rest of the semantic information of the lexical entries of the compound constituents.

- Importantly, all this is accomplished with the **same machinery** that is already used for **derivation**.
- The **key innovation** of the model is the **enrichment** of lexical entries through the incorporation of slots for qualia and other features, to produce a **flexible, generative mechanism** that accounts for the semantics of a **wide range** of compounds.
- The generativity comes from the information **inside** the lexical entries of the constituents, which interact with pragmatics, and that compose with each other **inside** the entries, **not detached** from them.
- Given that the SSM accounts for the morphology of several languages genetically unrelated to Spanish, which suggests that its constructs may be **universal** (§ 5), an important aspect to consider is the possible **universality** of the SSM approach as applied to **compounding**, given that it applies to such a wide range of compound types.

- **Future studies** could explore the extent to which the SSM formalism applies to **additional types** of compounds, as well as compounds in languages unrelated to Spanish, English and German.
- **Japanese**, for example, has endocentric NN and AN compounds that seem to be amenable to the SSM analysis (e.g. *hude-bako* ‘pencil box’ and *naga-banasi* ‘long talk’) (Kageyama & Saito 2016).

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