

Degree in English Studies  
Academic Year 2015-2016.  
Semantics.  
Tutor: Begoña Vicente Cruz

# Polysemy

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**INDEX**

**Abstract .....2**

**Introduction..... 3-4**

**Homonymy vs. polysemy..... 4-6**

**Types of polysemy..... 6-12**

**Polysemy in phraseology..... 12-14**

**Sense representation and processing theories ..... 15-18**

**Evidence for and against main representation theories..... 19-23**

**Conclusion..... 23-24**

**Bibliography..... 25-27**

**Abstract**

Beginning with an explanation of lexical ambiguity in general, this paper focuses on polysemy. First, it makes a clear distinction between homonymy and polysemy, the two main lexical ambiguity types, to later finish this first section supporting the theory of a lexical ambiguity continuum as proposed by Lyons (1977) and Klepousniotou (2012) among others. The second section focuses on polysemy types, first making reference to the standard account concerning this matter, Alan Cruse's, and then explaining two other minor theories, those by Andreas Blank and Vyvyan Evans. After talking about polysemy in isolation, information about polysemy in phraseology will be given, based on the paper by Omazić (2008). Later on, an account of theories about sense representation (in the mental lexicon) and access will be given, making reference to the link between them. Among the representation theories, the focus lies on two, the *sense enumeration hypothesis* and the *one representation hypothesis*. Even though these two theories are the most important ones, there are some others, especially within literalist approaches: rule-based approaches, the coercion hypothesis and lexical pragmatic approaches. As far as access is concerned, three main theories are given: the ordered search model, the selective (or context-dependent) access model, and the multiple (or exhaustive) access model (Klepousniotou, 2002). After this analysis, some experiments will be provided for and against the two main theories concerning sense representation in the mind. The first one, by Klepousniotou (2002), makes reference to the distinction between homonymy and polysemy in terms of representation in mind. A second experiment will be provided, this time by Beretta et al. (2005), who made a MEG study which ends up providing evidence in favor of the one representation hypothesis. Lastly, an experiment by Klepousniotou et al. is provided, also in favor of the previously mentioned hypothesis. Finally, taking into account that most of the experiments shown are in favor of the one representation hypothesis, this paper will show support for this theory, not without making reference to its limitations.

## Introduction

Semantics is traditionally described as the study of meaning communicated through language (Saeed, 2009), in simpler terms, it is the branch of linguistics that deals with the meaning of words and sentences. It is true that meaning can be studied through different linguistic views, but it is undeniable that semantics is an indispensable linguistic branch which deals with this matter.

“To understand a sentence we must know much more than the analysis of this sentence on each linguistic level. We must also know the reference and meaning of the morphemes and words of which it is composed, naturally, grammar cannot be expected to be of much help here. These notions form the subject matter for semantics” (Chomsky, 2002).

According to Cruse (2000), within the study of meaning there are many areas of interest, the main ones are the following:

- 1- Grammatical semantics: studies aspects of meaning closely related to syntax
- 2- Logical semantics: studies the “relations between natural language and formal logical systems such as the propositional and predicate calculi”
- 3- Linguistic pragmatics: which (for present purposes) can be simply defined as the branch of linguistics that studies the way that context influences meaning.
- 4- Lexical semantics: studies the meaning of ‘content’ words.

The present paper will focus on the latter, lexical semantics, as it is intended to analyze a phenomenon related to word meaning: polysemy.

The idea of a word containing multiple meanings dates back to the stoics, who observed that “a single concept can be expressed by several different words (synonymy) and that conversely, one word can carry different meanings (polysemy)” (Ravin and Leacock, 2000). But the first time the term “polysemy” appeared was in Michel Bréal’s *Essai de Sémantique* (1897), later on translated into English under the name of *Semantics: Studies in the Science of Meaning* (1900), from which the following excerpt, containing the newly coined term, is taken:

“The new meaning of a word, whatever it may be, does not make an end of the old. They exist alongside of one another. The same term can be employed alternately in the strict or in the metaphorical sense, in the restricted or in the expanded sense, in the abstract or in the concrete sense.

In proportion as a new signification is given to a word, it appears to multiply and produce fresh examples, similar in form, but differing in value. We shall call this phenomenon of multiplication Polysemia<sup>1</sup>”

This definition could nowadays be thought of as obsolete, but it was of a vital importance in order to set the principles that govern the study of polysemy in present days.

From 1900 onwards, many studies have been carried out concerning lexical ambiguity, but it seems that decades of psycholinguistic research have focused on homonymy comprehension rather than polysemy comprehension (Klepousniotou et al., 2008). This fact is curious as polysemy is much more frequent in language than homonymy, in fact, according to Lee (1990), 93 of the 100 most frequent words in English text are polysemous. This little attention towards polysemy, in terms of research, could have been due to

“the predominance of generative grammar with its focus on the sentence as the central unit of meaning. However, with the emergence of the cognitive grammar during the 1980s polysemy emerged on the research agenda as a key topic in lexical semantics” (Falkum & Vicente, 2015).

The aim of this paper is to analyze polysemy from different perspectives focusing on the distinction between homonymy and polysemy, the classification of polysemy into types (through different theories), polysemy in phraseology and sense representation and processing theories. Finally the present paper will collect several pieces of evidence in favor of the one representation hypothesis, also making reference to the need for further research on this matter.

### **Homonymy vs. polysemy**

When a given word is thought to have more than one meaning, in other words, when it comprises two or more possible readings, it is classified as lexically ambiguous. This ambiguity type is usually divided into two main categories, namely homonymy and polysemy. The former can be defined as the phenomenon where a word has several meanings, these meanings being unrelated. The latter, in contrast, is applied to words with

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<sup>1</sup> From πολύς, “numerous”, and σημειον, “signification”. (Breàl, 1900)

two or more related meanings. In other words, “whereas homonymy (whether absolute or partial) is a relation that holds between two or more distinct lexemes, polysemy (‘multiple meaning’) is a property of single lexemes” (Lyons, 1995). This traditional definition though is imprecise and, as it is, a more detailed definition of both features will be provided.

As mentioned before, homonymy is considered a lexical ambiguity type where the different unrelated meanings share the same orthography and phonology. An example of this ambiguity type would be the well-known *bank*, meaning (i) financial institution and (ii) land at river’s edge. A lexicographer would draw two different lexical entries for this noun (*bank*<sup>1</sup>, *bank*<sup>2</sup>), as both senses are semantically independent from one another.

Polysemy, on the other hand, accounts for ambiguous words that, besides sharing the same orthography and phonology, also share some semantic connection, in other words, whose different senses are semantically related. The word *book*, for example is considered a polysemous word as it comprises several distinct meanings as:

- A written text that can be published in printed or electronic form
- A set of pages that have been fastened together inside a cover to be read or written in
- One of the parts that a very long book, such as the *Bible*, is divided into (i.e. *The Book of Job*)<sup>2 3</sup>.

As illustrated above, the possible senses of the word *book*, are somehow related and so, a lexicographer would place them in the same lexical entry.

Traditionally, there are two criteria to distinguish both types: etymology and the previously mentioned related/unrelated meaning factor. As far as etymology is concerned, words from distinct sources are considered homonymous, whereas those which derive from the same source are considered polysemous. This etymological criterion, though, is not always conclusive, as many words have an unknown background. The second criterion is far more used, since usually, ambiguous word senses are easily defined as related or unrelated. Nonetheless, even though there is an evident connection between

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<sup>2</sup> Taken from the Cambridge Online Dictionary.

<sup>3</sup> This is just a sample, as the original possible meaning list is too long.

polysemous words' senses, it is very difficult to establish a common semantic feature for each of them; that is why relatedness and unrelatedness seem not to be appropriate terms for lexical ambiguity distinction. There are many cases where native speakers of a language don't agree on whether word senses are related or not, there is no clear cut distinction, and as a result, many authors (Lyons, 1977; Klepousniotou et al., 2012, among others), have asserted that lexical ambiguity should be represented as a continuum rather than a dichotomy (homonymy vs. polysemy), as illustrated below:

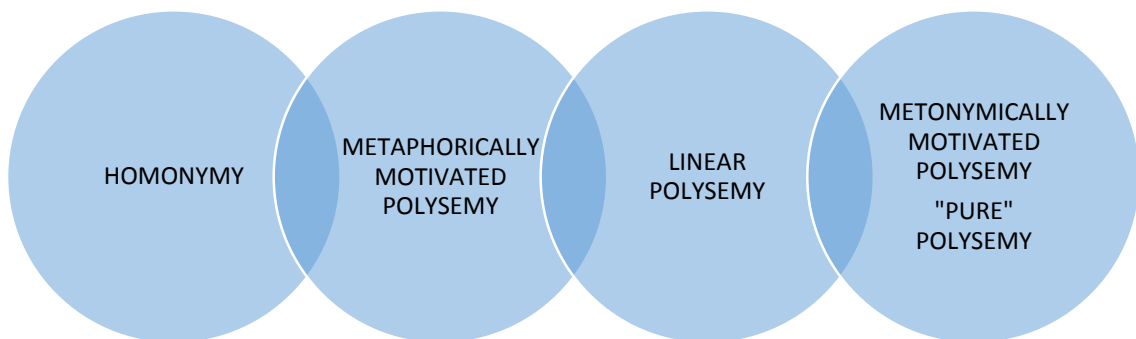


Figure 1. Lexical ambiguity continuum<sup>4</sup>

### Types of polysemy

According to Cruse (2000) polysemy can be divided into two different types: linear and non-linear. Linear polysemy accounts for a specialization-generalization relation between senses and, in turn, is divided into four types: autohyponymy, automeronymy, autosuperordination and autoholonymy. Metaphorical and metonymous polysemy are thought to belong to the non-linear category. In order to obtain a more in-depth description of these terms, a full description will be given below.

#### 1. Linear polysemy

<sup>4</sup> Following Cruse's theory on Polysemy Types, which will be explained later on.

- a. Autohyponymy: it occurs when a word has a sense describing a general quality of that word, and another sense which makes reference to a subvariety of that general idea. Cruse (ibid) gives the example of *dog* which may refer to the general sense of “member of a canine race” (as a counterpoint to other races) or to the more specific sense of “masculine member of a canine race”, making a gender distinction inside the same species.
- b. Automeronymy: it is very similar to autohyponymy but, in this case, the specific sense could be defined as a subpart rather than a subtype of the general sense. A clear example for this could be the word *table*, which could make reference to the whole piece of furniture (legs, panel, screws...) or just to the table-top: *three people were needed to move the table to another room vs. put the books back on the table, please.*
- c. Autosuperordination: Cruse (ibid) defines this type by giving examples. A clear one would be the use of *man* as referring to mankind and the same word as opposed to *woman*.
- d. Autoholonymy: this case of polysemy is the less clear one, as it is very difficult to distinguish it from automeronymy. An example for it would be the word *arm* with one of its senses including the hand, as in *he lost an arm in the accident* and the other one not, as in *a scratch in the arm* (Cruse, 2000).

## 2. Non-linear polysemy

- a. Metaphor: metaphor plays a very important role in many word senses relation, that is to say, many are related metaphorically. According to The Concise Oxford Dictionary of Linguistics, its definition can be as follows: “figure of speech in which a word or expression normally used of one kind of object, action, etc. is extended to another”. This definition is useful in general linguistic terms but, as far as polysemy is concerned, the only relevant feature is that metaphor is based on resemblance (ibid). Take as an example the well-known *America is a melting pot*, where a single culture emerging from many different ones is associated by resemblance to a melting pot. Another example would be the following sentence: “His



refusal set off a chain of events that ended in his arrest”. In this sentence the word *chain* is not used in its literal meaning, but it describes a succession of linked events, an idea that can be related by resemblance to the physical image of *chains*. It seems that some types of metaphorically motivated polysemy are closer to homonymy (Apresjan, 1974; in Klepousniotou et al., 2012), even though the reason why is not clear yet.

- b. Metonymy: traditionally, metonymy is defined as a person or object being referred to using as the vehicle a word whose literal denotation is somehow pertinently related (Griffiths, 2006). Put in a simpler way, “figure of speech in which a word or expression normally or strictly used of one thing, is used of something physically or otherwise associated with it” (The Concise Oxford Dictionary of Linguistics). In this case, the most relevant characteristic in terms of polysemy is that it is based on association. An example of this, could be the usage of capital city names so as to refer to the whole country as in *London and Madrid don't agree with the decision taken in the assembly* (instead of *England and Spain...*). Metonymically motivated polysemy is thought by some authors to be the representation of “pure” polysemy (Apresjan, 1974; in Klepousniotou et al., 2012), and Pustojevsky (1995) divided it into several subtypes, namely count/mass, container/containee, producer/product, product/institution, figure/ground and place/people to name just a few.

Cruse (2000) also states that “some cases of polysemy are systematic in the sense that the relationship between the readings recurs over a range of lexical items that is at least partly predictable on semantic ground”. He asserts that metonymy can be highly systematic, whereas metaphor is considered the least systematic one; linear polysemy also has some systematicity.

Even though Cruse's theory on Polysemy types is the most accepted one, there are many other linguists who have made their own hypothesis. Among these linguists we find Andreas Blank, who gives an alternative to Cruse's classification, in his article *Polysemy in the Lexicon*, providing seven different polysemy types based on the origins of polysemous words. Blank agrees with Cruse in that he also considers metonymic and metaphorical polysemy but, in his theory, there are five more types: co-hyponymous, taxonomic, auto-converse, antiphrastic and auto-antonymic. Taking into account both,

the type of semantic change and their synchronic counterparts, Blank (1999) draws the following table to illustrate his theory:

| Types of lexical semantic change  | Synchronic relation when conventionalized   |
|---|---|
| <p><b>1. Metaphor</b></p> <p>E <i>mouse</i> ‘small rodent’ &gt; ‘computer device’</p> <p>It <i>afferrare</i> ‘to grasp’ &gt; ‘to understand’</p> <p>L <i>brevis</i> ‘short (spatial)’ &gt; ‘short (temporal)’</p>   | <p><b>A. Metaphoric polysemy</b></p> <p>E <i>mouse</i> ‘small rodent’, ‘computer device’</p> <p>It <i>afferrare</i> ‘to grasp’, ‘to understand’</p> <p>L <i>brevis</i> ‘short (spatial)’, ‘short (temporal)’</p>  |
| <p><b>2. Co-hyponymous transfer</b></p> <p>? ratt- ‘rat’ &gt; F (reg.), It (reg.) ‘mouse’</p> <p>Pt <i>aborrecer</i> ‘to annoy s.o.’ &gt; ‘to bore s.o.’</p>  | <p><b>B. Co-hyponymous polysemy</b></p> <p>F (reg.) <i>rat</i>, It (reg.) <i>rat, ratta, ratto</i> ‘rat’, ‘mouse’</p> <p>Pt <i>aborrecer</i> ‘to annoy s.o.’, ‘to bore s.o.’</p>  |
| <p><b>3. Semantic extension</b></p> <p>MF <i>pigeon</i> ‘pigeon raised for eating’ &gt; ‘any kind of pigeon’</p> <p>Sp <i>tener</i> ‘to hold’ &gt; ‘to have’</p>  | <p><b>C. Taxonomic polysemy</b></p> <p>F <i>pigeon</i> ‘pigeon raised for eating’, ‘any kind of pigeon’</p> <p>Sp <i>tener</i> ‘to hold’, ‘to have’</p>   |
| <p><b>4. Semantic restriction</b></p> <p>VulgL <i>homo</i> ‘human being’ &gt; ‘man’</p> <p>F <i>blé</i> ‘corn’ &gt; ‘wheat’</p>   | <p>F <i>home</i>, It <i>uomo</i>, Sp <i>hombre</i> etc. ‘Human being’, ‘man’</p>  |
| <p><b>5. Lexical ellipsis (absorption)</b></p> <p><b>a) Absorption into the determinatum</b></p> <p>Sp <i>coche</i> ‘coach’ &gt; ‘car’ (&lt; <i>coche</i> automóvil)</p> <p>G <i>Schirm</i> ‘shelter’ &gt; ‘umbrella’ (&lt; <i>regenschirm</i>)</p> <p><b>b) Absorption into the determinans</b></p> <p>F <i>diligence</i> ‘velocity’ &gt; ‘stage-coach’ (&lt; <i>carosse de diligence</i>)</p> | <p>F <i>blé</i> ‘corn’, ‘wheat’</p> <p>Sp <i>coche</i> ‘coach’, ‘car’</p> <p>G <i>schirm</i> ‘shelter’, ‘umbrella’</p> <p><b>D. Metonymic polysemy</b></p> <p>F <i>diligence</i> ‘velocity’, ‘stage-coach’</p> <p>G (<i>der</i>) <i>Weizen</i> ‘wheat’, (<i>das</i>) <i>Weizen</i> ‘beer made of wheat’</p> <p>L <i>lingua</i> ‘tongue’, ‘language’</p> |

|  |  |
|--|--|
| G <i>Weizen</i> ‘wheat’ > ‘beer made of wheat’<br>(< weizenbier)   | F <i>défendre</i> ‘to defend’, ‘to forbid’<br>G <i>während</i> ‘while (temp.)’, ‘whereas’<br>(advers.)’  |
| <b>6. Metonymy</b><br>L <i>lingua</i> ‘tongue’ > ‘language’<br>L <i>defendere</i> ‘to defend’ > F <i>défendre</i> ‘to forbid’<br>G <i>während</i> ‘while (temp.)’ > ‘whereas’<br>(advers.)’  | F <i>forain</i> ‘non-resident’, ‘belonging to the fair’<br>Sp <i>sueño</i> ‘dream’, ‘sleep’  |
| <b>7. Popular etymology</b><br>F <i>forain</i> ‘non-resident’ > ‘belonging to the fair’ (< foire)<br>L <i>somnium</i> ‘dream’ > Sp ‘sleep’ (< somnus)  |  |
| <b>8. Auto-converse change</b><br>It <i>noleggiare</i> ‘to lend’ > ‘to borrow’<br>L <i>hospes</i> ‘host’ > ‘guest’   | <b>E. Auto-converse polysemy</b><br>It <i>noleggiare</i> ‘to lend’, ‘to borrow’<br>F <i>hôte</i> , It <i>ospite</i> , Cat <i>hoste</i> , Occ <i>oste</i> ‘host’, ‘guest’                             |
| <b>9. Antiphrasis</b><br>F <i>villa</i> ‘country house’ > F (argot) ‘prison’<br>It <i>brava donna</i> ‘honorable lady’ > It (gergo) ‘prostitute’   | <b>F. Antiphrastic polysemy</b><br>F <i>villa</i> ‘country house’, F (argot) ‘prison’<br>It <i>brava donna</i> ‘honorable lady’, It (gergo) ‘prostitute’   |
| <b>10. Auto-antonymy</b><br>E <i>bad</i> ‘not good’ > E (slang) ‘excellent’<br>Sard. <i>masetu</i> ‘gentle’ > ‘irascible’  | <b>G. Auto-antonymic polysemy</b><br>E <i>bad</i> ‘not good’, (slang) ‘excellent’<br>Sard. <i>masetu</i> ‘gentle’, ‘irascible’   |
| <b>11. Analogous semantic change</b><br>F <i>polir</i> ‘to polish’, ‘to steal’_ <i>fourbir</i> ‘to polish’ > ‘to steal’,<br><i>Nettoyer</i> ‘to clean’ > ‘to steal’ etc<br>L <i>levare</i> ‘to lift up’, ‘to erect’_ Sp <i>alzar</i> , It <i>alzare</i> ‘to lift up’<br>> ‘to erect’ | All relations possible, e.g.<br><b>Metaphoric polysemy:</b><br>F <i>fourbir</i> ‘to polish’, ‘to steal’<br><b>Metonymic polysemy:</b><br>Sp <i>alzar</i> , It <i>alzare</i> ‘to lift up’, ‘to erect’ |

Following the table above, it is presumable that the first type of lexical-semantic change is based on a similarity between two concepts from different domains, whereas

the following three types (co-hyponymous transfer, semantic extension and semantic restriction) seem to be built on similar concepts within the same domain, “as in most cases one of the two concepts involved in the semantic change was conceived as a prototypical instance of the whole category and therefore as a cognitive reference-point” (Ibid). Type five, absorption, is divided into two subtypes (absorption into the determinatum and absorption into the determinans) depending on which part of a given complex word absorbs that word’s sense, but synchronically, absorption can be related to taxonomic and metonymic polysemy. In the case of metonymy, it is, as well as its synchronic correspondent, based on conceptual contiguity, that is to say, both senses had associated semantic features before the change. Popular etymology produces the same synchronic response, but diachronically it differs as, in this case, conceptual contiguity combines with formal similarity.

“Type 8 deals with the reciprocal interconnection of participants in a frame, such as the HOST and the GUEST in the frame “RECEIVING GUESTS”. When such a converse relation develops within the same word, we call this auto-converse change leading to auto-converse polysemy. Although being a classical instance of opposition, this is rather a special case of contiguity which one could also list among metonymy”. (Blank, 1999).

Types nine and ten also make reference to opposite senses in one word, but in this case the underlying meaning is *contrast*. Taking into account these features, and assuming that polysemy is like a chain of different senses, Blank makes the following representation of the word MAN<sub>n</sub>:

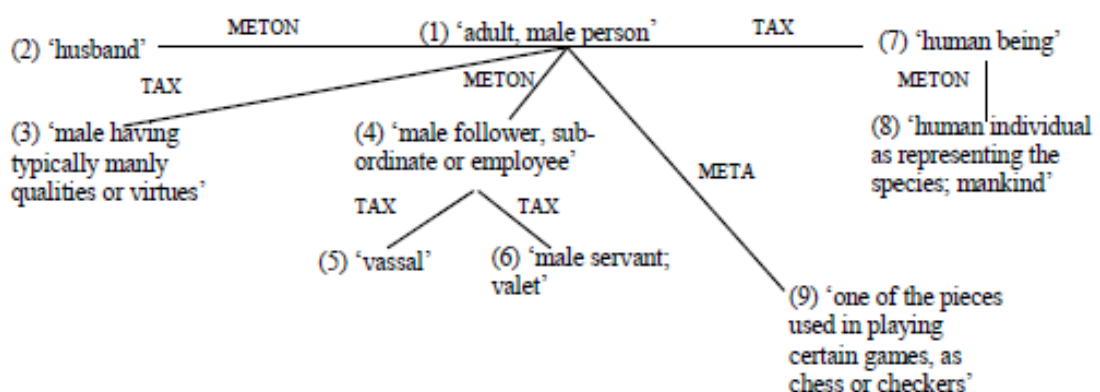


Figure 2. Blank’s representation of the word MAN.

Apart from these previously mentioned theories, there is a more recent one proposed by Vyvyan Evans (cf. Falkum & Vicente, 2015) based on cognitive linguistics. More precisely, his polysemy classification into three different types is based on his LCCM theory (Theory of Lexical Concepts and Cognitive Models). As said, Evans distinguishes between three polysemy types: conceptual, lexical and inter-lexical. The former deals with open class lexical items which can be differently interpreted depending on context; the second one addresses distinct lexical concepts in a [physical container] lexical relation or a [psycho-somatic state] lexical relation, both associated with the preposition *in*; lastly, the latter “involves systematic similarities between distinct lexical concepts associated with distinct lexical forms” (Falkum & Vicente, 2015). Below are examples of the three types:

1. That book is heavy/illegible/boring/long. (‘tome’/ ‘text’/ ‘level of interest’/ ‘duration’). **CONCEPTUAL POLYSEMY.**
2. a) We are in a room/ in pain. (‘container’/ ‘state’). **LEXICAL POLYSEMY**  
 b) We are in pain/ in a room. (‘state’/ ‘spatial’)
3. We are on the run/ on the sand. (‘state’/ ‘spatial’). **INTER-LEXICAL POLYSEMY**

### **Polysemy in phraseology**

Even though polysemy is traditionally studied as an isolated phenomenon, there are some papers that analyze this lexical ambiguity type in the context of phraseology. In this section polysemy in phraseology will be analyzed based on the work by Omazić & Schmidt (2008). In this paper, polysemy in phraseology is defined as “multiple meanings of units in the phrase-lexicon”, put in other words, several possible meanings of multi-word units whose individual items are often polysemous themselves. That is why polysemy in phraseology is thought to occur at two levels, the phrase level and the individual idiom constituent level. Glucksberg (1993, in Omazić & Schmidt, 2008) argues that a commonly used idiomatic expression leads to what he calls “phrase-induced polysemy”, which is what gives additional senses to idioms. This idea will be studied later through the phrase “spill the beans”.

Traditional phraseology would assert that every additional sense of a given phrase finds its origin in a single idiomatic meaning from which all the others are developed. But

according to Omazić & Schmidt (2008), this is not the best way of accounting for the relation between possible meanings of a given phrase, they rather analyze them in terms of Lakoff's view of polysemy, "in which the different readings form links in the meaning chains". The different possible senses are ordered in a way that adjacent links are more related in meaning than distant ones. In order to exemplify this type of classification, the expression *red-eye* will be analyzed. Apart from its literal meaning ("medical condition in which the sclera of someone's eye appears red in color") this expression may have the following idiomatic readings (Omazić & Schmidt, 2008):

- *Informal* a danger sign on a railroad
- Red-eyed salt water fish (like *bass*)
- Red-eyed vireo (*preacher bird*)
- *Slang* AmE, a night flight
- *Slang* inferior whiskey
- *Red-eye effect*, the appearance of red eyes in photos due to the use of a flash
- *Calgary Red-eye*, a drink made of beer and tomato juice
- *Red-eye*, beer with Clamato (spiced clam and tomato juice)
- *Red-eye gravy*, a sauce used in the cuisine of the Southern United States
- *FIM-43 Redeye*, a type of US missile common in the Vietnam War
- *Red-eye*, a drug

As has been shown, the expression *red-eye* has many different senses which are thought to be derived from one single meaning, probably the literal one. All these meanings are reflected in the polysemy chain for *red-eye*, in which adjacent links are taken to be more related in meaning than distant ones (Omazić & Schmidt, 2008):

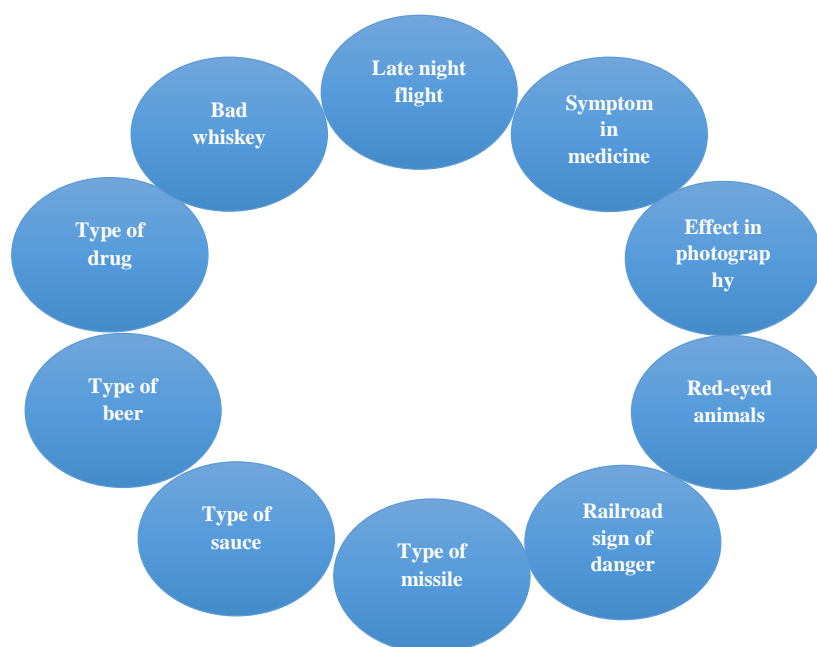


Figure 3. Polysemy chain for red-eye.

In order for polysemy to occur, there must be some interrelation between the different senses of a lexically ambiguous word. This interrelation may be already established or newly created to fill a particular need. This can be illustrated by the phrase *spill the beans* used in Omazić & Schmidt (2008) in its literal, idiomatic and ad hoc use. The literal use of this phrase is found in the following example:

1. *Oro Farmers spill coffee beans in joy*. Most people around the world have little idea about how coffee, a favourite hot drink, can move people to do fantastic things. Coffee growers especially pin their hopes on this important cash crop. Near Ogonomu in the Afore area of Northern Province, the people were so overjoyed that coffee buying had resumed that they danced, brandishing 50 kilogram heavy bags of coffee and *spilled some beans* on the ground to express their joy (Omazić & Schmidt, 2008).

This use of the expression is clearly literal, which can be deduced by context. The idiomatic use of the phrase has the meaning of “reveal a secret”, and even if evidence was found about the etymological and cognitive links between the literal and the idiomatic use of the phrase, “traditional phraseology would [...] treat them as cases of homonymy” (Omazić & Schmidt, 2008) even though they are not. The paper also shows two cases of ad hoc use of the phrase *spill the beans*, two novel meanings that are used in specific contexts:

1. *Spill the beans*, but not in Bay. Is it news when 10 million gallons of *raw sewage* spills into San Francisco Bay?
2. I heard that after having those five cans of beer you had to *spill the beans* in the toilet.

These two examples are provided by Omazić & Schmidt (2008) and exemplify the fact that these ad hoc uses are a result of linguistic innovation based on similarity metaphors (beans related to dirty or stinking objects). In other words, “the level of literal meaning is linked to idiomatic meaning through etymological and cognitive links that lead to sense extension [...] to fit new contextual and communication needs” (Omazić & Schmidt, 2008).

## Sense representation and processing theories

Among all the debates dealing with polysemy, there are two that could be considered crucial: the debate about how the different senses of polysemous words are stored in the mental lexicon and that about how are they processed. These two issues are very closely linked, which will be shown later on. To begin with, there are two main theories dealing with sense representation: the “sense enumeration lexicon hypothesis” and the “one representation hypothesis”.

1. **Sense enumeration lexicon hypothesis (SEL):** This hypothesis claims that all the possible senses of a given polysemous word are represented in the mental lexicon. That is, there is a distinct representation for each sense of a polysemous word (cf. Falkum & Vicente, 2015). This model doesn't seem to differentiate much between homonymy and polysemy, as in it this difference is not relevant in terms of storage and processing; the different senses of both lexical ambiguity types are stored separately in the lexicon and, as far as processing is concerned, it consists in selecting a sense among all the other possibilities associated with the given ambiguous word. Even though the present theory is very simple, it presents several problems. First of all, considering that all the possible senses of a word are stored separately in the lexicon would demand a huge storage capacity, but it also fails to distinguish between those aspects of meaning that are part of word meaning proper, and those that result from its interaction with the context, a problem sometimes referred to as the ‘polysemy fallacy’ (Sandra, 1998, in Falkum & Vicente, 2015). Second, taking into account that many words are polysemous, selection of a sense for one expression would depend on the selection of senses for the rest, which would lead to a great possibility of combinations, causing delay in processing. The sense enumeration hypothesis, as mentioned before, doesn't distinguish between homonymy and polysemy, which contradicts experimental evidence in this field<sup>5</sup>.
2. **One representation hypothesis:** This theory can be considered the antithesis of the previous one, as it claims that “senses of a polysemous expression either belong to or depend on a single representation” (Falkum & Vicente, 2015). There are two approaches considered part of this hypothesis, the core meaning hypothesis and

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<sup>5</sup> Different experiments against and in favor of each hypothesis will be presented in the next section.



the underspecification hypothesis. As there is no clear cut distinction between both approaches, Falkum & Vicente (2015) consider the core meaning hypothesis as a kind of underspecification approach.

The underspecification approach holds that, when encountering a polysemous word, the hearer accesses an underspecified representation rather than opting for a particular sense. According to Frisson (ibid, 2015), which defends this hypothesis, the underspecification approach is compatible with Pustejovsky's notion of qualia structures<sup>6</sup> and the core meaning hypothesis itself, which holds that the hearer accesses a representation of an abstract meaning shared by all the possible senses of a polysemous word. In this view, the lexicon is seen not as a static set of words where everything is stored, but rather as an active "generator" of new senses (cf. Klepousniotou, 2002), where there is a central or core sense from which the rest or the senses are achieved.

Apart from these two theories, considered the most important ones, there are some literalist approaches which assert that, firstly, the hearer accesses the literal meaning of the word and then, taking into account the context in which the word was given, speakers are driven towards different senses. Within this approach there are three main hypotheses: rule-based approaches, the coercion hypothesis and lexical pragmatic approaches.

1. Rule-based approaches: this approach conveys that, after accessing the literal meaning of the polysemous word, the hearer applies a conventional rule to reach another sense. An example of this approach could be Jackendoff's analysis of the so called 'statue case' (cf. Falkum & Vicente 2015);

"Imagine that we are watching a wax reproduction of the Beatles at Mme. Tussauds, and someone utters Ringo is the Beatle that I like the most, by this intending to communicate that 'Ringo is the wax figure that I like the most'".

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<sup>6</sup> Pustejovsky (1995) claims that the meaning variants of nouns exist due to specific rules of semantic composition, "tied to systematic properties of the lexical item" (cf. Saeed, 2009). These properties are called **qualia** in his theory. This qualia structure has four dimensions: constitutive, formal, telic, and agentive. For further information see Pustejovsky (1995).

As ‘Ringo’ is a proper name, i.e., a referring expression which lacks sense, so this is arguably a case of reference transfer (from the individual to a representation of that individual), rather than a case of polysemy in the sense in which we’ve described it here. The interesting thing is that, according to Jackendoff, there is a linguistic rule that says that any NP can stand for an object or for a physical representation of that object. And it is this rule that takes as from, say, ‘the lion’ to ‘the representation of a lion’ in examples such as ‘One of the lions in Trafalgar Square was damaged by the vandals’ attack.’

2. The coercion hypothesis: this theory claims that some polysemous words go through a process of coercion, defined as a “mechanism which takes as its input a literal meaning, and forced by a type-mismatch when composing with the other lexical meanings in the sentence, delivers a different meaning as output” (ibid, 2015). In other words, a reinterpretation process in which an expression X in a way ‘repairs’ a mismatch between its grammatical properties and those of the syntactic context in which it appears<sup>7</sup>. However, this theory has been criticized due to the fact that it is costly in processing terms; coercion needs time as speakers need to retrieve the literal meaning, find the mismatch and then solve it.
  
3. Lexical Pragmatic approaches: this approach, as its name implies, lies in the field of lexical pragmatics, which tries to explain how linguistically specified (‘literal’) word meanings are modified in use (Wilson, 2004). Basically, this type of approach claims that after the activation of the literal meaning of a polysemous word, the hearer must rely on the context to get the sense he/she is looking for. So basically, it can be said that this approach is like the rule-based one, but instead of linguistic rules, it relies on contextual inference to derive the appropriate sense for the expression.

As far as processing is concerned, there are three main models that deal with lexical ambiguity, namely the ordered search model, the selective (or context-dependent) access model, and the multiple (or exhaustive) access model (Klepousniotou, 2002). The former one holds that each sense of a given ambiguous word is accessed according to their

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<sup>7</sup> From Gregory, 2000. In Semantics notes (2014) by Begoña Vicente.

frequency. The selective access model, in contrast, states that only the meaning which is compatible with the context would be activated. Recently, this version has been revised and has given rise to the context-sensitive model, which maintains that “activation is selective but either meaning frequency or biasing context can influence the activation process depending on the contextual strength” (ibid, 2002). Concerning the multiple (or exhaustive) access model, it claims that only after the activation of all the possible senses, does the context play the role of deciding which one is the appropriate sense (Simpson, 1984, 1994. In Klepousniotou, 2002). Taking into account the limitations and advantages of each model, Duffy et al. (1988, In Klepousniotou, 2002) proposed a hybrid model called the “reordered access model”, which maintains that before all the senses are accessed, context affects this access by “increasing the availability of the contextually appropriate meaning without affecting the alternative meaning”. This model found empirical support from previous studies using eye movement data (i.e. Rayner & Frazier, 1989, in Klepousniotou, 2002).

It is important to note that these models are usually related to homonymous words, as evidence about polysemy has been scarce so far, concerning processing and representation. Nonetheless, there is some evidence that homonymous and polysemous words are processed differently. The main difference between the two lexical ambiguity types is found in processing time. In the case of polysemy, as the possible senses aren't mutually exclusive, there would be no need for immediate sense selection. Homonymy, on the other hand, implies incompatibility within possible senses and so, one meaning must be selected before further process occurs, which would imply a longer time of processing (Klepousniotou, 2002). This longer time of activation in the case of homonymy is sometimes said to be due to competition:

“Orthographic patterns of words are linked to more than one semantic pattern if a word is homonymous. When the network encounters an orthographic pattern of a homonymous word, both of its meaning representations will compete with each other. The consequence of this competition is that it will take longer to arrive at a stable activation pattern” (Beretta et al. 2005).

To finish with, it is important to note that this model seems to assume that the different senses of a polysemous word are independently represented, something which is far from established, as the following sections' experiments will show.

## Evidence for and against main representation theories

One of the most remarkable antagonisms in the study of polysemy is that of the one-representation hypothesis and the sense enumeration hypothesis, both theories being the most representative ones concerning polysemous sense representation in mind. In the present section some experiments will be presented which support the one-representation hypothesis, and also some partial evidence in favor of the sense enumeration hypothesis is provided.

To begin with, as mentioned in the previous section, the sense enumeration hypothesis doesn't make any distinction between homonymy and polysemy, in other words, it claims that both lexical ambiguity types behave the same way as far as processing is concerned. This claim has been proved to be false by many authors (Beretta et al., 2005; Klepousniotou et al., 2012; Rodd et al., 2002, etc...) carrying out experiments about time of access and processing.

The one representation hypothesis was first put forward by Frisson and Pickering (1999) after encountering many problems in the sense enumeration hypothesis (in relation to polysemy). These problems, namely

“the lack of a frequency effect for word senses, the absence of a blind unidirectional resolution process (e.g., first trying to always integrate a literal or a more basic sense before moving to another sense), and the improbability of a direct access view or a model in which all senses of a word are activated indiscriminately to the same degree” (Frisson, 2009)

led Frisson and Pickering (1999) to assert that instead of activating a specific sense of a given polysemous word, the hearer activates a semantically underspecified meaning applicable to all the possible meanings. Since then, many authors have found evidence in favor of this hypothesis; some of these experiments are explained below.

The experiment carried out by Klepousniotou (2002) was as follows: forty-five native speakers of English, with an average of 22 years of age and an average of 16.5 years of education participated. Three types of target real words were used: the critical (primed) ambiguous words, control words matched for type of ambiguity, and control words matched for frequency of occurrence (Klepousniotou, 2002). The mean reaction times (in milliseconds) and the Standard Deviations (in parenthesis) for all conditions are shown in the table below:

| Target type       |                      |                      |                      |                      |                      |                      |
|-------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                   | Ambiguity control    |                      | Frequency control    |                      | Word                 |                      |
|                   | Meaning 1            | Meaning 2            | Meaning 1            | Meaning 2            | Meaning 1            | Meaning 2            |
| Ambiguity type    |                      |                      |                      |                      |                      |                      |
| Homonymy          | 564 ( $\pm 78$ )     | 578 ( $\pm 87$ )     | 538 ( $\pm 74$ )     | 552 ( $\pm 84$ )     | 526 ( $\pm 84$ )     | 543 ( $\pm 70$ )     |
| Metaphor          | 574 ( $\pm 98$ )     | 549<br>( $\pm 117$ ) | 584<br>( $\pm 108$ ) | 576 ( $\pm 78$ )     | 513 ( $\pm 66$ )     | 525 ( $\pm 88$ )     |
| Name <sup>8</sup> | 629<br>( $\pm 141$ ) | 647<br>( $\pm 159$ ) | 649<br>( $\pm 129$ ) | 630<br>( $\pm 133$ ) | 634<br>( $\pm 163$ ) | 634<br>( $\pm 130$ ) |
| Metonymy          | 614<br>( $\pm 106$ ) | 587 ( $\pm 74$ )     | 620<br>( $\pm 102$ ) | 626<br>( $\pm 125$ ) | 511 ( $\pm 85$ )     | 518 ( $\pm 68$ )     |

Taking into account these data Klepousniotou (2002) concluded that greater priming effects and faster reaction times were observed for metonymous words than for homonymous words, which implies that depending on the type of ambiguity, the processing in the mental lexicon is going to be different. The author also noted that there is not a significant relation between frequency and polysemy. Following these data, it is improbable that the Sense Enumeration Lexicon Hypothesis gives an appropriate account for the representation of lexically ambiguous items, as this theory makes no distinction between homonymy and polysemy (a distinction that has been proved to exist). In order not to draw conclusions on the basis of a single experiment, more pieces of evidence will be provided.

Beretta et al. (2005) made a MEG (magnetoencephalographic) study in order to test the two main accounts concerning lexical ambiguity representation in the mental lexicon. Earlier experiments already had provided evidence in favor of the single-entry approach, however, the author found possible that “sensitivity to ambiguity type was a late-occurring response and that, at an early stage of processing, homonymy and polysemy would behave in the same way, as would be consistent with separate-entry accounts” (ibid.). That is the reason why the author choose a MEG study, because “it permits

<sup>8</sup> Words with the producer/product metonymic extension.

recording of neural responses at earlier stages of lexical processing”. In the present experiment, Beretta et al. (2005), found that the behavioral results (from a reaction time experiment) and the neural results (from the MEG study) correlated. Polysemy and homonymy showed distinct processing profiles not only in behavioral responses (occurring around 600-650 milliseconds), but also in neural M350 responses occurring approximately 300 milliseconds earlier. Concerning processing, the present experiment found evidence for the processing time advantage of words with a greater number of possible senses. So it seems that the results for this experiment supported previous evidence on this matter, namely that a single-entry account would be the most convenient theory of polysemous word representation in the mental lexicon; and so, it seems to disconfirm the hypothesis that “both homonymy and polysemy involve multiple lexical entries at some stage of processing” (ibid.). This finding then is consistent with the idea that, whereas homonymous words seem to have different lexical entries from which later on the hearer will choose, polysemous words’ different senses are represented in the mental lexicon by a single item. “The fact that frequency can explain the homonymy disadvantage but cannot explain the many senses advantage may be seen as further confirmation” for the claim that while homonymous words have separate entries, polysemous words do not (ibid.).

Klepousniotou et al. (2012) found evidence in support of the previously mentioned experiments by doing an EEG (electroencephalogram) investigation on this matter. This experiment was found to prove that both (i) the strength of the semantic relatedness and (ii) the combination of target type and prime’s relative bias towards one meaning pointed to different neurocognitive processing mechanisms in homonymy and polysemy. In simpler words, that both polysemy and homonymy were proved to be processed differently. Bearing in mind these results, this experiment suggested that homonymous words have several mental representations, one for each of its unrelated possible meanings. In other words, the different meanings of a given homonymous word are stored separately in the mental lexicon and compete for activation when required. As far as polysemous words are concerned, this study is consistent with the core meaning hypothesis (inside the one representation hypothesis), “only a basic sense with general specifications about the meaning of the word (i.e., a single, semantically rich representation) may be assumed to be stored in the lexicon” (Klepousniotou et al., 2012). The subordinate senses are assumed to be generated from the basic one, because of their

close relation in meaning. It is remarkable that this experiment also draws a difference between metaphor and metonymy, which would imply that metaphor is not that closely related to polysemy, an idea consistent with the Lexical ambiguity continuum theory provided in previous sections where metaphor would lie somewhere between homonymy and “pure” polysemy.

The single representation connected to polysemous words could be either an item with several common features for all the possible senses of the polyseme or rather a rich representation which makes all possible senses available (Vicente, 2015). In either case, what seems to be clear is that whereas homonymous meanings are stored separately, each polysemous sense facilitates access to the others, suggesting that the storage of both lexical ambiguity types must be different.

Even though most evidence is found in favor of the one representation hypothesis there are some authors that found evidence supporting the sense enumeration hypothesis in relation to polysemous words. Foraker and Murphy (2012) carried out an experiment focusing on the role of sense frequency, and found out that polysemous words have separate sense representations, like homonymous words. Their findings matched the sense enumeration hypothesis in that the correct sense of polysemous words were found to be easily derived from context, that comprehension is sensitive to sense frequencies and that the dominant sense was easier to access than the subordinate one. All these findings support the idea of the hearer tending to interpret the most frequent sense of a polysemous word firstly, “but primarily when the frequency differences are large” (Foraker and Murphy, 2012).

In a comparison to previous results, Foraker and Murphy (2012) make reference to a paper by Klein and Murphy (2002) in order to prove that polysemous senses are distinct, which would make polysemy get closer to homonymy and therefore, to the sense enumeration hypothesis. But as Klein and Murphy (2002) themselves point out:

“It is important not to exaggerate the separation of polysemous senses in our results. For example, we found that more similar senses were stored together [...] In addition, we chose polysemous senses that were clearly distinct in meaning [...] did not use type-token polysemy which naïve subjects might not even identify as being different senses. Nor did we use subtle differences [...] in which different aspects of the same word are emphasized depending on the perspective of the speaker.” (Klein and Murphy, 2002; in Beretta et al., 2005).

It is true that these findings clash with the one representation theory, but the authors admitted that they only used a certain type of polysemy in their experiment, so that this idea cannot be associated with polysemy in general terms. Even though the one representation hypothesis has been shown to be more appropriate than the sense enumeration hypothesis by several authors (Klepousniotou, 2002; Beretta et al., 2005; Rodd et al., 2002, etc...), it is clear that more research in this field must be held in relation to the issues concerned.

## **Conclusion**

The present paper started with an introduction about semantics in general and, little by little, it narrowed the scope to end up introducing the topic of the work, polysemy. In order to define this term in depth, it was compared to homonymy, as both terms share some important characteristics, but as demonstrated in the first section, their differences are bigger. Later on, the paper showed the different types of polysemy according to Cruse (2000), namely autohyponymy, automeronymy, autosuperordination and autoholonymy (under the category of linear polysemy) and on the other hand, metaphor and metonymy (under the category of non-linear polysemy). After analyzing these types, which are thought of as the standard account concerning this issue, two more theories of polysemy types were introduced. One by Andreas Blank (1999), who categorizes polysemy in terms of the origins of the lexical ambiguity, giving rise to seven different polysemy types: metonymic, metaphorical, co-hyponymous, taxonomic, auto-converse, antiphrastic and auto-antonymic. The last theory of polysemy types analyzed is a novel one by Vyvyan Evans, who differentiates between three different types: conceptual, lexical and inter-lexical polysemy (Falkum & Vicente, 2015). After going through these three theories concerning polysemy categorization, polysemy in phraseology has been analyzed, following the paper by Omazić & Schmidt (2008). Afterwards, some sense representation and processing theories were presented, making reference to the link between them. The

Sense enumeration lexicon hypothesis (SEL) and the one representation hypothesis were treated as the main theories concerning representation in the mental lexicon, even though some other minor theories were also mentioned. As far as access is concerned three different models were presented, the ordered search model, the selective (or context-dependent) access model, and the multiple (or exhaustive) access model



(Klepousniotou, 2002). And last, some experiments were presented as supportive evidence for the one representation hypothesis. First of all, the experiment carried out by Klepousniotou (2002) was presented, which showed that there were differences in the processing of homonymous and metonymous words, showing that the claim by the sense enumeration hypothesis (that there are no differences between both lexical ambiguity types) is wrong. Beretta et al. (2005) carried out a MEG study with similar findings, and so did many other authors. Even though the one representation hypothesis has been proved to be the most appropriate one dealing with representation, some authors like Foraker & Murphy (2012) have found support for the sense enumeration hypothesis. As there are still many open questions about the correct hypothesis, this paper makes reference to the need for further investigation in this matter, taking into account that both theories have been proved to have limitations.

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