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The Spectrum of Sense Remoteness in Polysemy: Bridging Computational and Theoretical Lexicography with Psycholinguistics (Part 2)[1]

Abstract

This two-part paper bridges insights from psycholinguistics and from theoretical and computational lexicography to develop a fine-grained classification of polysemy organized along a wider spectrum of sense remoteness of ambiguous words in Polish based on the investigation of a large collection of linguistic data. In the second part, we show that polysemy is not a stable phenomenon and relations between senses may differ across language users. For instance, our fifty-fifty class or borderline cases may be represented differently by different language users depending on their perception of the world, world knowledge, associations. We point to some parameters of variation in the class of polysemy by metonymy and polysemy by metaphor which may affect their sense remoteness and consequently also the way they are represented in the mental lexicon.

Abstrakt

Ten dwuczęściowy artykuł konsoliduje fakty dotyczące polisemii z zakresu psycholingwistyki oraz leksykografii teoretycznej i obliczeniowej oraz prezentuje wyniki badań ilościowych i jakościowych przeprowadzonych na dużym zbiorze danych polisemicznych w języku polskim, na podstawie których proponujemy uszczegółowioną klasyfikację polisemii oraz opracowujemy poszerzone spektrum podobieństwa sensów słów wieloznacznych. W drugiej części publikacji wykazujemy, że polisemia nie jest zjawiskiem stabilnym, a relacje między sensami mogą być oceniane odmiennie przez różnych mówców w zależności od ich postrzegania świata, wiedzy o życiu i skojarzeń. Wskazujemy na kilka parametrów zróżnicowania, które mogą wpłynąć na ocenę podobieństwa sensów i reprezentację w mentalnym leksykonie polisemii przez metonimię i metaforę.

4. Nested polysemy

It transpires that a significant portion of the analysed material constitutes nested polysemy, which has so far been unnoticed in the psycholinguistic literature on polysemy although it is thoroughly described in theoretical lexicography. In the next section, we will review relevant observations about nested polysemy from a lexicographic perspective, discuss selected examples, show that the class of nested polysemy itself is not homogeneous and that there are subtypes of it as well as determine the place of these subtypes of nested polysemy in our spectrum of remoteness.

The first classification of nested polysemy was proposed by Apresjan (1974), who analyzes it in terms of typological polysemy: radial, chain, and radial-chain.

In radial polysemy, all meanings of a word are motivated by the same – central – sense (e.g., *baza* 'base' as 'something serving as a support, element that keeps an object stable on the ground' as the central sense for the derivation of *baza* as 'something that constitutes the basis, making further reference possible' as well as for the derivation of *baza* as 'infrastructure complex providing facilities for specific activities').

In chain polysemy, each new sense of a word is motivated by another – the closest – sense, but the extreme meanings may not share common semantic features, cf. *lewa ręka* 'left hand' vs. *lewa strona* 'left side' (located

on the side of the left hand) vs. *left desk drawer* (located on the left side if the observer is facing the front of the object) vs. *left wing party* (politically radical). Chain polysemy – in its pure form – is uncommon.

In radial-chain polysemy, new senses are motivated in a two-fold manner: first by the central sense and then by the derived senses. For example, *klasa* as in *klasa przedmiotów* 'the category of objects' (= 'category') is the source for the motivation of the sense *klasa* understood as 'degree' as an example of radial polysemy, and then within the group of senses that have arisen through the chain polysemy from the sense 'category' are, among others, *klasa robotnicza* 'the working class' (= 'social group') or *klasa ssaków* 'the class of mammals' (= 'group of homogeneous objects within certain systematicity') and those that have arisen through the chain polysemy of the sense 'degree' are *gra wysokiej klasy* 'the high class game' (= 'measure of quality') or *pokazać klasę* 'show (your) class' (= 'high quality'). This type of polysemy is the most common of the three.

When it comes to the types of typological polysemy, it is worth discussing one difference – between direct and indirect polysemy. In the case of direct polysemy, the similarity between two senses is revealed in the first stage of semantic description, while in the case of indirect polysemy, the similarity between two senses is revealed in the subsequent (second or further) stage of semantic description.

Although the description of nested polysemy posited by Apresjan (1974) constitutes a strong reference point, there still remain some open questions with regard to how these three types of typological polysemy are reflected in sense remoteness. We have observed that nested polysemy is far from being as uniform as it is observed by Apresjan (1974).

A more diversified classification is posited by Markowski (2012). Apart from radial (which he also calls "star") and chain polysemy, thereby the types distinguished by Apresjan (1974), the spectrum is extended to concentric (broadening or narrowing), disjunctive and mixed polysemy.

The radial and chain types of polysemy are treated in a very similar fashion by both Apresjan (1974) and Markowski (2012). Markowski (2012) additionally suggests that in radial (or star) polysemy, the type of motivation may be different even within one set of senses, e.g., *ręka* 'hand' motivates *mistrzowska ręka* 'master handicraft' (= 'making something in a certain way') on the basis of metaphor and the same lexeme *ręka* 'hand' motivates *gwizdać na rękę* 'whistle at hand play' (= 'type of prohibited touching of the ball in a football game') on the basis of metonymy.

An interesting – yet relatively rare – kind of typological polysemy constitutes concentric broadening polysemy, which is defined by Markowski (2012) as the one in which the primary sense has the narrowest range and

each subsequent (secondary) sense has a wider semantic range, e.g., *rodzina* 'family' (= 'spouses with children') motivates increasingly broader senses of *rodzina*, as in *zjazd całej rodziny* 'family reunion' (= 'living people related by blood or affinity'), further *rodzina Golderingów od wieków zajmowała się produkcją wina* 'the Goldering family has been involved in wine production for centuries' (= 'people descended from a common ancestor'), and even further extended onto *rodzina języków indoeuropejskich* 'Indo-European language family' (= 'a group of objects or phenomena of the same kind').

The second subtype of the concentric polysemy constitutes the narrowing polysemy. Unlike in the broadening polysemy, here the primary sense has the widest range and each subsequent sense has a narrower range, e.g., *temperatura* 'temperature' or *pogoda* 'weather' in which the primary sense relates to the state and the secondary sense to the particular instance of the state (cf. *temperatura wody* 'water temperature' vs. *mieć temperaturę* 'have a fever' and *prognoza pogody* 'weather forecast' vs. *jutro będzie pogoda* 'weather will be good tomorrow').

The next type of polysemy classified by Markowski (2012) is disjunctive polysemy. In this case, the primary sense is general and the subsequent senses specify it, but each in a different way. The subsequent senses are not semantically related to one another, e.g. *liczba* 'number' (= 'a mathematical symbol used to express or count a given quantity') motivates three different senses, yet the range is not increasingly broader or narrower. These specific senses, listed in a random order are as follows: *liczba wolnych miejsc* 'number of places available' (= 'a number of certain units; manpower'), *liczba laureatów konkursu* 'number of competition winners' ('a group of people'), *liczba pojedyncza rodzaju męskiego* 'singular masculine' (= 'grammatical category'). Since the subsequent senses are loosely related to one another here, if the overall meaning disappears, they cease to be perceived as elements of the same entity, i.e. as senses of the polysemous word. According to Markowski (2012), this is the case in which the phenomenon of homonymous polysemy decay (Pl. 'rozpad homonimicznego polisemu') takes place and today we are inclined to treat these words as homonyms.

Correspondingly, Markowski (2012) indeed touches upon the radial-chain polysemy (referred to as such in Apresjan's taxonomy), but he calls it mixed polysemy.

The notion of semantic distance between senses is especially troublesome in nested polysemy because of the number of possible combinations for the polysemic motivation. Our contribution is not only to extend the classification proposed by Apresjan (1974) and Markowski (2012) but also to situate this heterogeneous type somewhere in the existing spectrum of sense remoteness. A feature that distinguishes nested polysemy is that there is no direct link between senses. In other words, there must be an intermediate

link (a nest) between senses in nested polysemy. An important observation about nested polysemy from a psycholinguistic perspective is that it may be categorized according to three distinctive features: (i) the presence of an identifiable generic nest from which the senses are derived as subclasses; (ii) the presence of a morphological root, which functions as a nest for the other senses to emerge typically via affixation, back-formation or clipping; and (iii) the presence of a root which by itself is metonymically or metaphorically polysemous and the derived senses are related to the nest via these distinct metonymic or metaphorical senses.

Based on the above features, we propose the following semantically-driven categorization (rather than structurally), which rests upon the tenets posited in Core Meaning hypothesis (Frazier and Rayner 1990; Frisson and Pickering 1999, 2007; Frisson 2009, 2015; Pickering and Frisson 2001), Sense-Enumeration Lexicon (Klein and Murphy 2001, 2002; Pylkkänen, Llinás and Murphy 2006; Foraker and Murphy 2012) and Relevance Theory-inspired view (Falkum 2010, 2011): **nested generic polysemy, nested morpho-semantic polysemy** and **nested meta-polysemy**. We believe that the proposed division better reflects the actual sense distance, putting aside the purely lexicographic observations and taking into account the conceptual domains and processes which come into play. By that we understand that the three proposed semantically-driven subtypes of nested polysemy may involve radial, chain, radial-chain, broadening, narrowing, disjunctive or mixed types of nested polysemy structure.

4.1. Nested generic polysemy[2]

During the analysis of the material we encountered examples of polysemy where it was impossible to distinguish between primary and derived senses. Rather, the senses were very closely interconnected and they were intuitively of equal rank. On closer inspection we concluded that all the senses of polysemous nouns in (7) are not directly derivationally related but they are mediated by some generic semantic concept which constitutes a derivational nest and which does not necessarily need to be explicitly expressed in the given language as having a separate hyperonomous entry. The senses are then perceived as lexicalized instances of the generic concept which involve some of its features. In this respect, all the senses of the polysemous words in (7) narrow the meaning of the generic nest to its specific subkinds. We dub this kind of polysemy **nested generic polysemy**.

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[2] One may be tempted to compare our nested generic polysemy with Pustejovsky's (1995) and Dölling's (2020) systematic/inherent polysemy but we believe that our examples of nested generic polysemy do not pattern with the examples of systematic/inherent polysemy provided by Pustejovsky (1995) and Dölling (2020).
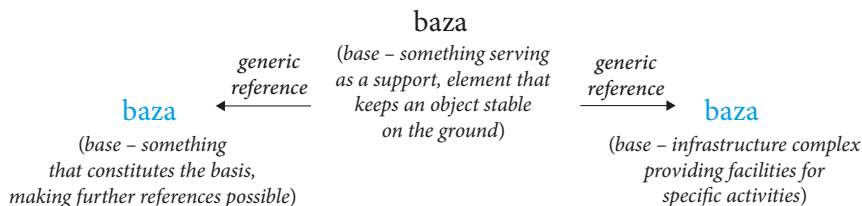
Figure 4: Excerpt of a derivational nest visualising nested conceptual polysemy for *baza* 'base'

(7)
  a. CZĘŚĆ (*znaczna* 'a major part' vs. *zamienna* 'a spare part')
  b. HISTORIA (*miłosna* 'a love story' vs. *powojenna* 'postwar history')
  c. KOSTIUM (*taliowany* 'a fitted costume' vs. *halloweenowy* 'a halloween costume')
  d. RADIO (tranzystorowe 'a transistor radio' vs. *katolickie* 'a catholic radio')
  e. ZESPÓŁ (*badawczy* 'a research team' vs. *rockowy* 'a rock band')
  f. WYPADEK (tragiczny 'a tragic accident' vs. *wyjątkowy* 'a special case')
  g. SPRAWA (*ważna* 'an important issue' vs. *sądowa* 'a legal case')
  h. GRA (planszowa 'a board game' vs. *aktorska* 'an actor's performance')
  i. ZWYCZAJ (*miejscowy* 'a local custom' vs. *brzydki* 'a bad habit')
  j. GUMA (balonowa 'bubble gum' vs. *arabska* 'arabic gum')
  k. BAZA (*wojskowa* 'a military base' vs. *logiczna* 'a logical base')
  l. PRZERWA (metrowa 'a one-meter break' vs. *szkolna* 'a school break')
  m. ZBIÓR (*tegoroczny* 'this year's crop' vs. *zbiór biblioteczny* 'a library collection')
  n. ZNACZEK (*metalowy* 'a metal tag' vs. *kolekcjonerski* 'a collectors' stamp')
  o. DOWÓD (mocny 'strong evidence' vs. *skradziony* 'a stolen ID')
  p. DZIENNIK (*pokładowy* 'a boarding log' vs. *poczytny* 'a high-profile journal')
  q. PISMO (*ładne* 'nice handwriting' vs. *urzędowe* 'a clerk's letter')
  r. NAUKA (polska 'Polish science' vs. *cenna* 'a precious lesson')

4.2. Nested morpho-semantic polysemy

In this subtype of nested polysemy the derivational nest has the form of a common morphological root. The senses are coincidentally formed by the same suffix in the case of affixation. This subtype is mainly reserved for feminatives (yet not all feminatives belong here), as exemplified in (8).

(8)
  a. CUKIERNICZKA (*srebrna* 'a silver sugar bowl' vs. *doświadczona* 'an experienced female confectioner')
  b. PARTYZANTKA (*nielegalna* 'illegal guerilla' vs. *blondwłosa* 'a blonde woman partisan')
  c. KAWIARKA (*stalowa* 'a steel moka pot' vs. *uprzejma* 'a polite female barista')
  d. MUZYCZKA (*wybitna* 'an outstanding female musician' vs. *chwytliwa* 'a catchy tune')
  e. PASTERKA (*uśmiechnięta* 'a smiling shepherdess' vs. *uroczysta* 'solemn midnight mass')
  f. PILOTKA (*młoda* 'a young female pilot' vs. *skórzana* 'a leather bomber jacket')

g. REKLAMÓWKA (*foliowa* 'a foil bag' vs. *dwuminutowa* 'a two-minute animatic')
h. SIEKACZ (*kuchenny* 'a kitchen knife chopper' vs. *bolący* 'an aching incisor')
i. DILERKA (*wytatuowana* 'a tattooed female dealer' vs. *nielegalna* 'an illegal activity of drug-dealing')
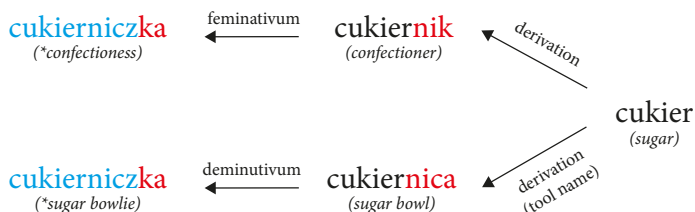

Figure 5: Excerpt of a derivational nest visualising nested morpho-semantic polysemy for *cukierniczka* 'sugar bowl' or 'female confectioner'

4.3. Nested meta-polysemy

The derived senses are motivated by metonymy (see Figure 4) or by metaphor (see Figure 5) directly from the semantic nest and then at least one of them is mapped onto a broader or narrower sense. This subtype is exemplified in (9).
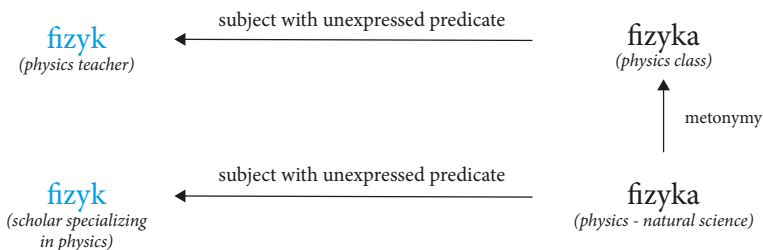

Figure 6: Excerpt of a derivational nest visualising nested metonymic polysemy for *fizyk* 'physics teacher' or 'scholar specializing in physics'
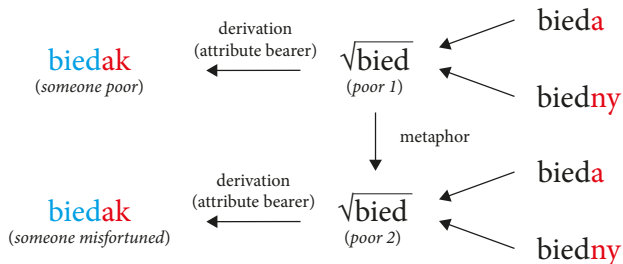

Figure 7: Excerpt of a derivational nest visualising nested metaphoric polysemy for *biedak* 'someone poor' or 'someone misfortuned'

(9)
  a. FIZYK (*sławny* 'a famous physicist' vs. *wymagający* 'a demanding physics teacher')
  b. BOKSERKA (*zadziorna* 'a quarrelsome female boxer' vs. *bawełniana* 'a cotton tank top')
  c. MALARZ (*wybitny* 'an outstanding painter' vs. *ścienny* 'a wall painter')
  d. CIEMNOTA (*umysłowa* 'intellectual ignorance' vs. *wiejska* 'rural narrow-mindedness')
  e. BIEDAK (*bezdomny* 'a homeless poor man' vs. *nieporadny* 'a clumsy poor thing')
  f. CZOŁÓWKA (*filmowa* 'a film theme song' vs. *ścisła* 'strict lead')
  g. ZIEMIANKA (*zamożna* 'a wealthy landlady' vs. *głęboka* 'a deep dugout')
  h. TRĄBKA (*blaszana* 'a tin trumpet' vs. *słoniowa* 'an elephant trunk')
  i. SŁUŻBA (*wojskowa* 'military service' vs. *nadworna* 'court service')

The presented subtypes of nested polysemy should be situated in different places in our spectrum. In the case of nested generic polysemy, different senses are connected to a joint generic core; moreover, some of the words from this subtype pass the co-predication tests. Thus, nested generic polysemy should be situated rather low in our spectrum of sense remoteness. As far as nested morpho-semantic polysemy is concerned, the identical form of the senses is often coincidental because the attached suffixes carry different information. At first glance this subtype may resemble homonymy and should be situated rather high in our spectrum of sense remoteness. The last subtype – nested meta-polysemy[3] – requires a metonymic or metaphoric shift derived from the nest and then, in the second description, another polysemic shift. Nested polysemy with a metonymic shift should be situated closer to polysemy by metonymy and nested polysemy by metaphor should be situated closer to polysemy by metaphor.

5. Fifty-fifty class

Another observation is that there are numerous words which can be classified as homonymous or polysemous. According to Carston (2020: 110–111), the phenomena of monosemy and homonymy are not stable. Many word coinages which are initially monosemous very quickly become polysemous and there may be a discrepancy between the work of lexicographers and the mental representations of words in the minds of individual language users. For example, two senses of a homonymous word may be

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[3] It would additionally be possible to divide this subtype into meta-polysemy based on metaphor and meta-polysemy based on metonymy. Yet this class is a rare one even without this sub-division and we wanted to maintain the classes well-represented.

historically related but language users may not be aware of it (etymology-oriented approach). The opposite situation is also possible where two unrelated objects referred to by a homonymous word share some resemblance with each other and they start to be represented as polysemous. Consequently, there may be individual differences in whether two senses of a word are perceived as polysemous (semantically related) or homonymous (semantically unrelated). In our spectrum we dub such ambiguous words which may be perceived as either homonymous or polysemous FIFTY-FIFTY. However, there are subtypes of this kind of ambiguity. In (10), there are some examples which may be perceived as homonymous or metonymically polysemous because one may attribute a false contingency relation between their two senses. For example, one may falsely assume that *goździk* 'clove' is a fruit of *goździk* 'carnation' or that *parkiet taneczny* 'a dance floor' is always made of *parkiet* 'parquet' or that *boczek* 'a flank' is made of *boczek* 'bacon' which is not true.

(10)   HOMONYMY/METONYMY
    a. GOŹDZIK (*kwitnący* 'a carnation in bloom' vs. *zmielony* 'ground clove')
    b. BOCZEK (*wędzony* 'smoked bacon' vs. *lewy* 'a left flank')
    c. PARKIET (*jodełkowy* 'herringbone parquet' vs. *taneczny* 'a dance floor')

In (11), there are examples of homonymy which may be perceived as nested polysemy with a generic nest.

(11)   HOMONYMY/NESTED POLYSEMY WITH A GENERIC NEST
    a. ETYKIETA (*dworska* 'court etiquette' vs. *naklejona* 'a sticker label')
    b. EKSPRES (*polarny* 'a polar express train' vs. *zepsuty* 'a broken coffee express')
    c. NUMER (*siedmiocyfrowy* 'a seven-digit number' vs. *popisowy* 'a good stunt')

Finally, some homonymous words may share some accidental resemblance and hence they are often perceived as expressing polysemy by metaphor. Such words are exemplified in (12).

(12)   HOMONYMY/METAPHOR
    a. GOŁĄBEK (*pocztowy* 'a carrier pigeon' vs. *pyszny* 'a delicious cabbage roll')
    b. SYRENA (*wyjąca* 'a howling siren' vs. *bajkowa* 'a fairy tale mermaid')
    c. POMPA (*ręczna* 'a hand pump' vs. *huczna* 'a spectacular blast')

IMMEDIATE
DERIVATION

MEDIATED
DERIVATIONAL
RELATION

Monosemy

Polysemy by
Metonymy

Nested Generic
Polysemy

Nested Meta-
Polysemy

Polysemy by
Metaphor

Nested Morpho-
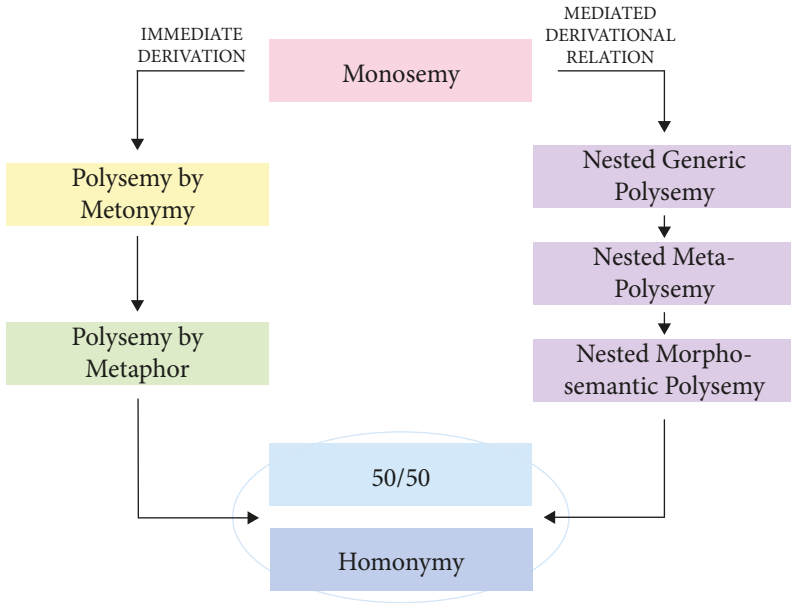semantic Polysemy

50/50

Homonymy

Figure 8: The extended spectrum of sense remoteness originally postulated by Klepousniotou and Baum (2007), Klepousniotou et al. (2008), Klepousniotou et al. (2012) with subcategorized nested polysemy and added 50/50 type

Monosemy	• an unambiguous word • a rare phenomenon • over time words cease to be monosemous
Polysemy by Metonymy	• a new sense within the same conceptual domain • direct semantic derivation • often zeugmatic • some senses may be separable and thus they do not pass co-predication tests • the derived unit (sense) must be defined with a reference to the primary one • very regular
Polysemy by Metaphor	• a new sense within a different conceptual domain • direct semantic derivation (according to perceptivity: mapping between animate, inanimate, concrete, abstract senses and by functions, features, appearance or symbol) • mostly irregular but some rare instances of regular metaphor are more akin to metonymy

Figure 9: Distinctive features of monosemy, polysemy by metonymy, and polysemy by metaphor which were used in the annotation process

Nested Generic Polysemy	• a common derivational base (a generic concept) • senses closely interconnected (of equal rank) • senses perceived as lexicalized instances of the generic concept (narrowed down to its specific subkinds)
Nested Meta-Polysemy	• a common derivational base • derived senses motivated by metonymy or by metaphor • at least one sense is not directly derived from the base
Nested Morpho-semantic Polysemy	• a common morphological root • not necessarily directly related to the central unit (possible intermediate links) • coincidentally formed by the same suffix

Figure 10: Distinctive features of nested generic polysemy, nested meta-polysemy, and nested morpho-semantic polysemy which were used in the annotation process

50/50	• vague border between homonyms and polysemes • mainly: polysemes whose etymology is unclear in the minds of the language users (e.g., culturemes) • also: homonyms for whom language users establish common origin (folk etymology) • words proved in lexicology to be homonyms with an easily identifiable common root in other languages
Homonymy	• ambiguous words with unrelated meanings • two distinct words which happen to have the same phonological representation of a word

Figure 11: Distinctive features of 50/50 type and homonymy which were used in the annotation process

6. Some insights and challenges from our work on metonymy and metaphor: Further extending the spectrum

This section is devoted to two types of polysemy which have been examined in most detail out of all the types of polysemy in both lexicographic and psycholinguistic considerations on multisense words: polysemy by metonymy and polysemy by metaphor. Yet even for them, the picture is not clear-cut.

6.1. Polysemy by metonymy

Schumacher (2019) states that we should aim at better understanding metonymy and developing its more fine-grained classification. In this vein, Dölling (2020) claims that in the case of nouns such as *book* (physical object vs. information), *speech* (information vs. event), *bank* (institution vs. building), *newspaper* (publisher vs. publication) or *lunch* (food vs. event) there is no reasons for assuming that one sense is prior. Dölling (2020) names this kind of polysemy inherent or logical and he distinguishes it from metonymic polysemy involving a metonymic shift from a primary to a secondary sense as in such nouns as *rabbit* (animal vs. meat), *oak* (tree vs. wood), *bottle* (container vs. unit of measure). Intuitively, the animal sense of *rabbit* is prior to its meat sense, the tree sense of *oak* is prior to its wood sense and a container sense of *bottle* is prior to its unit of measure sense. Dölling (2020) claims that inherent (our neighbouring) polysemy and metonymic polysemy behave differently under co-predication. Nouns featuring inherent polysemy pass co-predication tests, as shown in (13).

(13) Mary picked up and mastered the book. [physical object and information]

By contrast, nouns featuring metonymic polysemy do not pass co-opredication tests, as presented in (14).

(14) # John lifted and drank the cup. [container vs. content]

However, some examples classified by Dölling (2020) as representing true metonymic polysemy such as *oak* (tree vs. wood), *bottle* (container vs. unit of measure) pass co-predication or anaphoric tests in Polish, contrary to what is claimed by Dölling (2020), as shown in (15).

(15)
    b. container/unit of measure
       BUTELKA
       Wlał butelkę wody do zlewu i ją odłożył.
       'He poured in a bottle of water and put it away.'

    c. tree/wood
       DĄB
       Cały jego dom jest obłożony lokalnie rosnącym dębem.
       'His entire house is laid in locally growing oak.'

    d. animal/meat
       KRÓLIK
       Na święta upiekłam królika z hodowli ekologicznej i smakował wyśmienicie.
       'I roasted a rabbit from an ecological farm for Christmas and it tasted delicious.'

It appears that co-predication cannot be used as a reliable diagnostic tool for distinguishing between Dölling's (2020) genuine metonymy with a clear prior sense and inherent polysemy which according to the author has no clear direction of derivation. We still want to maintain that Dölling's (2020) inherent polysemy is in fact metonymic because typically there is a contiguity relation between the two senses e.g. *book* (content) and *book* (physical object) are in a vast majority of cases inseparable (they are part of the same spatiotemporal domain). The same is true of *bottle* (container) and *bottle* (unit of measure). In fact, in our study of polysemy we observed some instances of metonymy which seem to be clearly non-zeugmatic and we have a different explanation of this observation. Let us consider specific examples presented in (16) and (17).

(16) object vs. sound
    GWIZDEK (*chromowany* 'a chrome whistle' vs. *końcowy* 'a final whistle')
    *Chromowany gwizdek zakończył mecz.
    'The chrome whistle ended the match.'

(17) place/people in this place
    KLASA (*klimatyzowana* 'an air-conditioned classroom' vs. *zdolna* 'a clever class')
    Trzecia klasa miała dzisiaj lekcję WF-u, ale ponieważ była klimatyzowana, to się nie spociła.
    'The third classroom/class had a gym lesson today, but because it was air-conditioned, they didn't sweat.'

We dub this type of metonymy in (16) and (17) which does not pass co-predication tests MISBEHAVING METONYMY and the metonymy presented in (15) is called WELL-BEHAVING METONYMY. We think that the only difference between WELL-BEHAVING METONYMY in (15) and MISBEHAVING METONYMY in (16) and (17) is that in the former case the metonymic senses are typically perceived as belonging to one spatio-temporal domain and are inseparable in the latter case the senses are spatio-temporally separable. It seems to be the case that this difference may have a crucial impact on the behavior of metonymic words in co-predication tests. For example *klasa* understood as a group of students is not inseparable from *klasa* understood as their classroom. Regarding the position of these two types of metonymy in our spectrum, WELL-BEHAVING METONYMY with spatio-temporally inseparable senses should feature a smaller degree of sense remoteness than MISBEHAVING METONYMY with spatio-temporally separable senses. We would like to emphasize, however, that we do not claim that metonymy is always zeugmatic but rather we want to say that polysemy by metonymy is often zeugmatic and it is one the few types of ambiguity that allows for co-predication but in proper contexts even metonymic polysemes can be made to fail co-predication tests (see Schumacher

2013; Ortega-Andrés and Vicente 2019; Haber and Poesio 2020; Murphy 2021, among others).

Another observation made in our study of the material was that there are some borderline cases of polysemy – between nested polysemy and polysemy by metonymy. This case is a rather rare one – out of 400 pairs of words, we only found two of such cases, exemplified in (18) and (19), which we have already referred to in the section devoted to nested polysemy.

> (18) RADIO (*zepsute* 'a broken radio' vs. *katolickie* 'a catholic radio channel')
> (19) FIZYK (*kwantowy* 'a quantum physicist' vs. *szkolny* 'a school physics teacher')

Radio is such a borderline case because some language users may interpret *radio* as having the generic nest (radio waves) and others may treat *radio* (object vs. channel) as an instance of metonymy analogous to *gazeta* (object vs. institution). Similarly in the case of *fizyk*, some language users may perceive *fizyk* 'a teacher of physics' as being a scientist, which is generally not true. Most teachers of physics do not conduct research in physics.

There are also polysemous words which may be perceived as metonymic or metaphoric, as shown in (20–23).

> (20) KARK (*złamany* 'a broken neck' vs. *łysy* 'a bald muscleman')
> (21) FLAKI (*pyszne* 'yummy tripe' vs. *wyprute* 'ripped out guts')
> (22) PAS (*szczupły* 'a slim waist' vs. *skórzany* 'a leather belt')
> (23) GIPS (*ziarnisty* 'grainy plaster' vs. *zdjęty* 'a removed cast')

Łysy kark understood as a muscular and not very intelligent man and *kark* understood as the back of the neck may be treated as metonymic because both senses may be perceived as contiguous. However, for some language users these two senses may constitute two separate domains related by association. Similarly, *flaki* 'a tripe soup' is a kind of soup made of beef tripe which may be wrongly associated with *flaki* 'guts' leading to a metonymic relation between these two senses. Another example is *pas* 'a waist' and *pas* 'a belt'. For some language users both senses may be contiguous while for others a belt is clearly separable from a waist. Regarding the word *gips* 'gypsum' vs. 'a plaster', some language users may reason that a plaster is made of gypsum (creating a metonymic relation) but in fact modern plasters are made of lighter synthetic materials. All these examples show that there may be individual differences in how some polysemous words are organized in the mental lexicons of different language users.

6.2. Polysemy by metaphor

The mapping between conceptual domains between the senses corresponds to neural mappings in the brain, which entails that the human conceptual

structure is rigidly linked to its perceptual system (Lakoff 2014). It then seems especially important to organize the relation between polysemous senses motivated by metaphor according to perceptivity. Along with this line of reasoning, we identified five subtypes of polysemy by metaphor.

In (24) we present examples in which the conceptual domain of the primary concrete sense is mapped onto the secondary abstract sense.

(24)
a. PRZECIEK (*śródpłucny* 'an intrapulmonary endoleak' vs. *medialny* 'a media leak')
b. KOSMOS (*bezkresny* 'boundless universe' vs. *istny* 'something unusual, lit. real cosmos')
c. ŻYŁKA (*pulsująca* 'a pulsating vein' vs. *reporterska* 'a reporter's urge')
d. AURA (*mroźna* 'frosty atmosphere' vs. *magiczna* 'magic aura')
e. CIOS (*precyzyjny* 'an accurate blow' vs. *życiowy* 'a life's blow')
f. BARIERA (*metalowa* 'a metal barrier' vs. *psychiczna* 'a mental barrier')
g. MARGINES (*lewy* 'left margin' vs. *społeczny* 'a social underclass')

In (25) we present examples in which the connotation of the primary sense is mapped onto the secondary sense in the domain of "human". Examples (a)–(h) present mapping from animate to animate domain and examples (i)–(p) present mapping from inanimate to animate domain. Animacy may affect processing, so these examples are good candidates to create separate subtypes of polysemy by metaphor in the future, but we did not want to assume this a priori.

(25)
a. KOCIAK (*pręgowany* 'a tabby kitten' vs. *seksowny* 'a sexy pussy')
b. MISIEK (*dziki* 'a wild bear' vs. *napakowany* 'a jacked guy')
c. BÓSTWO (*celtyckie* 'Celtic deity' vs. *hollywoodzkie* 'a Hollywood idol')
d. BABCIA (*ukochana* 'a beloved grandma' vs. *moherowa* 'mohair beret (old) woman')
e. JĘDZA (*baśniowa* 'a fairy-tale witch' vs. *z dziekanatu* 'vixen from the dean's office')
f. ŻMIJA (*jadowita* 'a venomous viper' vs. *przemądrzała* 'a snooty cat')
g. ŚWINIA (*domowa* 'a domestic swine' vs. *szowinistyczna* 'a chauvinistic skunk')
h. BESTIA (*rogata* 'a horned beast' vs. *zdolna* 'a talented person')
i. BURAK (*pastewny* 'a fodder beet' vs. *skończony* 'a complete yap')
j. CYMBAŁ (*zabytkowy* 'an antique dulcimer' vs. *złośliwy* 'a mean booby')
k. TUMAN (*gęsty* 'a thick cloud' vs. *szkolny* 'a school blockhead')
l. PAJAC (*drewniany* 'a wooden harlequin' vs. *niepoważny* 'a ridiculous buffoon')
m. SZYCHA (*sosnowa* 'a pine cone' vs. *ważna* 'a key figure')
n. SKARB (*zatopiony* 'a sunken treasure' vs. *mój – o dziecku* 'my dear – about a child')
o. KOSA (*mechaniczna* 'a power scythe' vs. *wymagająca* 'a demanding teacher')
p. PIGUŁA (*przeciwbólowa* 'a painkiller' vs. *wredna* 'a mean nurse')

In (26) we present examples in which the function or feature of the primary sense is mapped onto the secondary sense.

(26)
    a. ŚLIZGAWKA (*lodowa* 'an ice slide' vs. *spadzista* 'a sloping slide')
    b. BIEŻNIA (*tartanowa* 'a tartan track' vs. *elektryczna* 'an electric treadmill')
    c. LÓD (*arktyczny* 'arctic ice' vs. *truskawkowy* 'a strawberry ice-cream')
    d. STATEK (*rybacki* 'a fishing vessel' vs. *kosmiczny* 'space ship')
    e. SASZETKA (*herbaciana* 'a tea bag' vs. *skórzana* 'a leather pouch')
    f. BALKONIK (*romantyczny* 'a romantic balcony' vs. *inwalidzki* 'an invalid walking frame')
    g. TAPETA (*kwiecista* 'a flowery wallpaper' vs. *przesadna* 'heavy make-up')

In (27) we present examples in which the shape (appearance) of the primary sense is mapped onto the secondary sense

(27)
    a. DZIÓB (*kaczy* 'a duck beak' vs. *drewniany* 'a wooden bow')
    b. SZPON (*tygrysi* 'a tiger claw' vs. *brokatowy* 'a brocaded nail')
    c. BRZUSZEK (*piwny* 'a beer belly' vs. *koślawy* 'a lopsided bowl')
    d. KAPELUSZ (*góralski* 'a highlander hat' vs. *robaczywy* 'a maggoty mushroom cap')
    e. DASZEK (*spadzisty* 'a sloping roof' vs. *skórzany* 'a leather peak')
    f. SERCE (*kurze* 'a chicken heart' vs. *czekoladowe* 'a chocolate heart')
    g. GRZYB (*trujący* 'a poisonous mushroom' vs. *atomowy* 'an atomic mushroom cloud')
    h. MUCHA (*bzycząca* 'a buzzing fly' vs. *ślubna* 'a wedding bowtie')

In (28) we present examples in which the conventional symbol attached to the primary sense is mapped onto the secondary sense

(28)
    a. SERCE (*o organie* 'a heart – about an organ' vs. *szlachetne* 'a noble heart')
    b. OSIOŁ (*o zwierzęciu* 'a donkey – about an animal' vs. *uparty człowiek* 'a jackass')
    c. ORZEŁ (*dziki* 'a wild eagle' vs. *klasowy* 'a top student')
    d. LIS (*oswojony* 'a tamed fox' vs. *szczwany człowiek* 'a sneaky man')
    e. REKIN (*oceaniczny* 'an oceanic shark' vs. *biznesowy* 'a business buccaneer')

7. Conclusions

In this study we attempted to bridge insights from psycholinguistics and from theoretical and computational lexicography to develop a fine-grained classification of polysemy and to arrange its different types along our proposed spectrum of sense remoteness. In our quantitative research on a large

sample of sense pairs randomly extracted from plWordNet (Słowosieć), we observed that the most widely represented are nested polysemy, polysemy by metaphor, and polysemy by metonymy. We present a detailed discussion of nested polysemy – so far an underrepresented type of polysemy in the literature. We identify three subtypes of nested polysemy: generic, morpho-semantic and meta-polysemy and we motivate their place in our spectrum of sense remoteness. Furthermore, we observe that polysemy is not a stable phenomenon and relations between senses may differ across language users. For instance, our fifty-fifty class or borderline cases may be represented differently by different language users depending on their perception of the world, world knowledge, associations. In our detailed research of the material clustered by us as polysemy by metonymy and polysemy by metaphor, we observed that not all examples of metonymy pass co-predication tests and we observe that these metonymic examples whose senses are spatio-temporally inseparable are by far more likely to pass co-predication tests than the ones whose senses can potentially be spatio-temporally separated; however this issue also needs further investigation. Furthermore, among metonymic examples we found some borderline cases which can be perceived as instances of polysemy by metaphor or as instances of nested polysemy by different language users.

During our analysis of the material belonging to the class of polysemy by metaphor we distinguished several subclasses where two senses are related by physical resemblance, shape, function, connotation, or symbol. We also observed that the derived sense may differ from the primary sense in some semantic feature e.g., animacy or concreteness. We think that all these aspects of variation in the class of polysemy by metonymy and polysemy by metaphor should be taken into consideration in future psycholinguistic research on polysemy. As illustrated repeatedly throughout the present work, polysemy stirs much discussion, especially when bridging psycholinguistic and lexicographic approaches. Consequently, it would be desirable to test the psychological reality of our proposed spectrum and to conduct experiments which would help us decide which of the distinguished types of polysemy fit which of the proposed models of polysemy representation discussed in the introductory section of this paper.

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