Is metonymy the prevalent cognitive mechanism of semantic shifts? Evidence from the DatSemShift database

Anna Smirnitskaya
Institute of Oriental Studies / Moscow
Institute of Linguistics / Moscow
nyushas@gmail.com

Abstract

This article examines the DatSemShift database of semantic shifts, reassessing its significance as a resource for investigating cognitive patterns of semantic change. Drawing on many years of work with the database, the author identifies and systematises the cognitive mechanisms underlying semantic shifts within the stages of the shift development. I suggest to identify the four stages of semantic shift: the preliminary state; the stage of the first cognitive action of the first Speaker; the stage of the first cognitive action of the first Listener (corresponding to the "invited inference" by E. Traugott) and the stage of the further dissemination (cf. "conventionalization of implicature"). Further I identify four cognitive mechanisms for the stage of the first Speaker's activity. These include the transfer based on external similarity, metaphorical extension, “classical” metonymical extension and the transfer based on “situational metonymy”. The factor of external motivation and the phenomenon of syncretism are also considered. Analysis of the 300 shifts in the DatSemShift 3.0 database with the greatest number of realisations, shows metonymy to be the prevalent cognitive pattern. This is also confirmed in the colexification data in the conceptually related CLICS database.

Keywords: semantic shift; metonymy; cognitive mechanism; metaphor; external motivation

Преобладает ли метонимия в процессах семантического развития? Данные каталога семантических переходов DatSemShift

Смирнитская А. А.
Институт востоковедения РАН/ Москва
Институт языкознания РАН / Москва
nyushas@gmail.com

Аннотация

Статья посвящена анализу базы данных семантических переходов DatSemShift 3.0 и переоценке её значимости как ресурса для изучения когнитивных механизмов семантических изменений. На основе многолетней работы с базой автор выделяет и систематизирует типы когнитивных механизмов, лежащих в основе стадий семантического перехода. В работе выделяются четыре стадии исторического развития семантического перехода: предварительное состояние, этап первого когнитивного действия первого Говорящего, этап первого когнитивного действия первого Слушающего (ср. «invited inference» по Э. Трауготт) и этап дальнейшего распространения (соответствующий «конвенционализации импликатуры» по Э. Трауготт). В когнитивных действиях первого Говорящего автор предлагает различать механизм переноса по внешнему сходству объектов, метафорический перенос, «классический» метонимический перенос и перенос на основании «ситуативной» метонимии. Также рассматривается влияние фактора внешней мотивации и явление синкретизма. В рамках квантитативного анализа показано, что в выборке из 300 переходов DatSemShift 3.0, имеющих наибольшее на сегодняшний день число реализаций, доминирует когнитивный механизм «классической» метонимии; аналогичная тенденция выявляется и среди наиболее частотных колексификаций в содержательно близкой базе данных CLICS.

Ключевые слова: семантический переход; метонимия; когнитивные механизмы; метафора; внешняя мотивация

1 Introduction

The database of semantic shifts in languages of the world DatSemShift (datsemshift.ru) has been under development since 2000, and has undergone a number of changes during this time (Zalizniak et al. 2012; Zalizniak 2018; Gruntov & Rykov 2023). Today it's the largest dataset of this type in languages of the world (Fugikawa et al. 2023). Its design has evolved, as have the methods for describing semantic shifts and the understanding of the subject itself.

In the classical approach the term "semantic shift" refers to a pair of meanings A (source meaning) and B (target meaning) that are connected by the relation of "cognitive proximity between two meanings" (Zalizniak et al. 2012: 633), revealing itself through the so called "realizations": 1) synchronic polysemy, e.g. 'to catch' → 'to understand', as in English *to grasp*[1]; 2) Diachronic semantic evolution: 'to catch' → 'to understand', as Old Russian *poyati* 'to take' → Russian *ponjat'* 'to understand'; 3) Morphological derivation: 'to count' → 'to tell, to narrate', as German *zählen* 'to count' → *erzählen* 'to narrate'; 4) Cognates: 'to catch' → 'to understand' as Russian *khapat'* 'to grasp' and Czech *chápat* 'to understand'; 5) Borrowing: Turkish *kavun* 'melon' → Ukranian *kavun* 'watermelon'. A more advanced interpretation portrays DatSemShift as a catalogue of motivational models of which semantic shift is one example, and others include motivational models based on the development of compositional lexical meaning (see Zalizniak, forthcoming).

Within the framework of the database, the fundamental unit of analysis is lexical meaning, represented by an English "label" elaborated manually by linguists (Zalizniak 2018) — a metalinguistic construct created to facilitate cross-linguistic generalization, cf. "comparative concept" in the sense of (Haspelmath 2010), see also the *Concepticon* within the CLICS database (Rzymsky et al. 2020). Primarily methodological, this construct can be interpreted as reflecting cognitive-level units, although this interpretation requires further investigation.

In this article, I will argue that the DatSemShift 3.0 database is a catalogue not only of semantic shifts, but also of cognitive patterns and I will address the question of whether metonymy is the most prevalent of them. The extensive data on different language families collected in DatSemShift makes it possible to advance the understanding of types of cognitive mechanisms underlying semantic shifts.

Indeed, the link between lexical meanings connected by semantic shift represents a "cognitive proximity" between these meanings, as has often been mentioned (Zalizniak et al. 2012, Zalizniak 2018). However, the **nature of this proximity** has rarely been addressed. The types of semantic shifts have been discussed many times in different papers. For example, the classification in Koch (2016) outlines the following types of semantic shifts: 1) metaphorization: *tissue* 'woven cloth' → 'aggregation of cells in animals or plants'; 2) metonymization: *board* 'table' → 'people sitting around a table, governing body'; 3) generalization: Classical Latin *avunculus* 'mother's brother' → Fr. *oncle* 'mother's or father's brother'; 4) specialization: Sp. *sombrero* 'hat' → Eng. *sombrero* 'Mexican hat'; 5) co-hyponymous transfer: Sp. *león* 'lion' → Sp. (South-American) *leon* 'puma'; 6) enantiosemy or auto-antonymous change: Eng. (slang) *bad* 'extremely good'. At the same time, Koch (2016) points out that many types in previous papers were distinguished on heterogeneous grounds (Koch 2016: 53). The present study restricts its scope to a typology of semantic shifts based solely on the cognitive mechanisms, taken within the stages of semantic shift.

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2 The stages of semantic shift and the corresponding cognitive mechanisms

The cognitive mechanisms of semantic change has been investigated from various perspectives in recent years (see Sweetser 1990, Vanhove 2008, Geeraerts 2010, San Roque et al. 2018, among others). Building on earlier research and on a systematic analysis of the DatSemShift database material, in this paper I propose to distinguish the following types of the cognitive mechanisms of semantic shifts distributed across the stages of the shift:

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[1] The description of semantic shifs and realizations follows the conventions of DatSemShift 3.0; labels in English represent the meanings, arrow or dash shows the direction of a shift or its absence. See (Zalizniak et al. 2026) for more information; (Rousseau 2019) on the direction of semantic shifts.

A0. The preliminary stage including the source lexical meaning considered together with the full set of situations in which it is used. The "external motivation" factor is relevant within this stage.
A1. The first cognitive action of the first Speaker, launching the process of semantic shift. In this action the Speaker links the existing word to a new lexical meaning; the following cognitive mechanisms within this stage are distinguished:

(1) The transfer based on the **similarity of appearance of objects**.
(2) The **metaphorical transfer** based on conceptual mapping of objects from one domain to another (similar to the definition in CMT (CMT - Conceptual Metaphor Theory, see for example, Kövecses 2020).
(3) The cognitive mechanism of **classical metonymy transfer** based on spatial, temporal, genetic etc. contiguity;
(4) The **situational metonymy,** based on contiguity of meanings within a single situation, including overlapping situations or situations that logically follow one another. The **change of frame** or micro-situation is also considered here.

A2. The first cognitive action of perceiving and understanding by the first Listener; here the **inferential** cognitive mechanism is activated (that corresponds to the "invited inference" in Traugott 2017).
A3. The stage of dissemination (corresponds to the "conventionalization of implicature" in Traugott 2017).
As can be seen, the cognitive mechanisms of generalization (extension to a broader class of objects or activities) and specialization (restriction to a narrower class) as well as co-hyponymous transfer, are treated here as instances of "classical metonymy," insofar as they involve a part–whole and co-hyponymous relationship between the related lexical meanings.

In some cases of semantic shifts, **no cognitive operation** is involved, the shift is established on the cross-linguistic basis; such instances are interpreted as manifestation of **semantic syncretism**. This definition is connected, but not reducible to, the definition discussed in Wälchli (2012) regarding cases of overlapping domains that resist strict categorisation. The semantic shift here is established merely on the typological grounds, on the base of distinction in other languages, while the given language does not conceptualize the difference between these two meanings. The examples include semantic shift such as #0858 bee — wasp; #1118 nail (body part) ↔ claw; or #1664 blue — green, describing the syncretism of the concept of blue and green colors in some languages.

3 The overview of each cognitive mechanism based on the DatSemShift 3.0 data

3.1 The cognitive mechanism of the stage A1

Let's consider these mechanisms in more detail, starting from the cognitive mechanisms of the stage A1, the activity of the first Speaker. The cognitive mechanism **(1) transfer by appearance similarity** often involves creating a name for a previously unknown phenomenon arising from migration, travel, trade etc. Unlike metaphorical transfer, transfer based on appearance similarity operates within the same or a semantically adjacent lexical domain. For example, a person may see a new animal and associate it with something familiar, as in the case of the Spanish (South American) *leon* 'puma', which comes from the Spanish *león* 'lion'. Similarly, the names of some mammals or fish may be based on the appearance similarity, as in the case of the English words for *seahorse* or *hedgehog*, rooted in the Old English words *hedge* 'thicket' and *hog* 'pig', built on the resemblance of the hedgehog's and pig's snout.

This applies also to many human-made artifacts, such as 'pearl' → 'bead' #7740[2], or 'fan palm' → 'umbrella' #4434 in the Polynesian language Niue. The artifacts familiar to a person can serve as prototypes for the names of more complex artifacts, as Bulgarian platno 'fabric' → 'sail' #7904, or even natural phenomena, such as Azerbaijan *qurşaq* 'belt' → 'rainbow' #1917.

[2] The numbers hereafter represent the IDs in the DatSemShift database.

Many terms in biology and physiology are based on this cognitive mechanism. For example, in the case of semantic shift 'key' (of a door) → 'clavicle' #999, Russian realization *klyuch* → *klyuchica* for the human skeletal part 'clavicle' (keybone) appeared as a calque from the Latin or Greek name, reflecting the bone's external resemblance to an ancient type of key, which was used in that period's culture and is completely different from the modern type. These 'imprintings' of ancient objects in semantic shifts can provide information about situations that took place in ancient times.

The cognitive mechanism **(2) of metaphorical transfer.** The metaphorical transfer requires a conceptual 'leap' — the transfer of meaning across clearly distinct semantic domains. In the classical theory of conceptual metaphor (CMT) of Lakoff and Johnson (1980), as well as in later developments such as "extended conceptual metaphor theory" (Kövecses, 2020), metaphorical transfer is analyzed as cross-domain mapping: the projection of conceptual structure from the source domain onto the target domain.

This type of cognitive mechanism is widespread among verbal meanings such as 'to touch' → 'to move/affect feelings' #360, 'to cut' → 'to stop doing something' #2163, 'to foam' → 'to get angry' #9198, as well as among nominal meanings such as 'taste' → 'aesthetic perception' #0817. The same cognitive mechanism is attested in the designation of social relations, as in the shift 'tail' → 'consequence' #4816 (an 'embodiment' metaphor for logical relationships); or sticky → 'annoying' #4604, in Turkish *cıvık,* etc.

The cognitive mechanism of metaphor allows the concepts of kinship to be mapped onto non-kin domains, as in the shift 'child' ↔ 'young animal' #3494 realized in Kannada *piḷḷe*; Kurukh *khadd* etc. (Smirnitskaya 2024). Notably, this shift is bidirectional: the meaning 'child' can describe baby animals, while diminutive animal name can serve as affectionate nickname for a child or spouse, cf. Russian *kotyonok* 'kitten' etc. Kin terms are often extended metaphorically to reflect social hierarchy, e.g. 'father' → 'priest' #3872, as in Kannada *ayya*, Lithuanian *tėvas*; 'son' → 'servant' #5067 as in Geez *daḳiḳ* etc.

The metaphorical cognitive mechanism of semantic shifts allows connections between lexical meanings of different categories, as a shift from a spatial meaning to temporal: 'behind' → 'afterwards, later' #0712, or from a temporal meaning to a logical one: 'afterwards, later' → 'consequently' #7461; and the shifts in the adjectival meanings, as 'fresh' → 'recent' #08363.

The cognitive mechanism **(3) of "classical" metonymy.** Unlike metaphor, this cognitive mechanism involves a relationship where one conceptual entity provides mental access to another entity in the same domain; on the base of conceptual contiguity, whether spatial, temporal, or causal (see Panther et al., 2009, for a detailed classification). In particular, we can analyse under the type of 'classical metonymy' semantic shifts such as 'place' ↔ 'bed' #5964 in Batsbi, 'beard' ↔ 'chin' #0389, 'beard' ↔ 'moustache' #3029, and so on. The genetic type (in terms of origin) can be attributed, for instance, to shifts 'metal → money' #2262 (since money is often made of metal); similarly, 'bee → honey' #8727; cotton → paper #1032, milk ↔ female breast #4786.

The cognitive mechanism **(4) of situational, or extended metonymy.** I propose distinguishing this specific type, in contrast to "classical" metonymy, to describe cases where one situation is linked to another, or a participant is connected to the situation. This mechanism relies on the contiguity of events within a single dynamic context (frame), often associating an action with its result or instrument, or a state with its cause, or different phases of overlapping events, cf. the term "processual metonymy" in Rakhilina et al. (2022). This cognitive mechanism is very common in the material of the DatSemShift database.

Within this type, the relationship between the 'participant' and the 'situation' can vary greatly. Examples of this subtype include semantic shifts as 'to hear' → 'ear' #9118; 'to give birth' → 'father' #5032; 'to see/look at' → 'mirror' #4646; and 'to hear' → 'rumour' #1142. Conversely, an action can be named after its main participant, as in the Arabic example of 'hand/arm' → 'to help, aid' #2938, but this happens rarely in the data. Some instances of situational metonymy are found at the intersection with temporal "classical" metonymy. In these cases, the semantic link is based on temporal contiguity, yet it is argued that the primary driver of the shift is situational. The time period is conceptualized as a container for a specific activity or event, for example 'harvest' ↔ 'August' #2405; 'berry' → 'August' #5721; 'nelma' → 'August' in Selkup' #5720, as this is the time of nelma fish migration and fishing season.

The cognitive mechanism **of change of frame** or micro-situation is also considered within this type. This type involves a shift in perspective regarding the participants and point of view on a situation. It is typically accompanied by a reorganization of the argument and syntactic structure. For instance, in olfactory perception, the perspective may shift from the Experiencer (the active agent: 'to smell', 'to sniff') to the Stimulus (the source: 'it smells'). Similarly, in visual perception, the focus shifts from the act of observation to the appearance of the object itself (the stimulus), as seen in the Russian *gljadet'* 'to look' and *vygljadet'* 'to have a certain appearance/look' #0624.

3.2 The cognitive mechanism of the stages A2 and A3

The next **inferential** cognitive mechanism is reconstructed to the stage A2 and the activity of a Listener. This cognitive mechanism has a long tradition of description, particularly within grammaticalisation theory and in the works of Traugott (Traugott and Dasher 2002, Traugott 2017 etc). Theoretical foundations for describing the mechanism of "invited inference" have mainly been developed using grammatical meanings. The description is based on language use; according to Traugott's theory, the Listener develops the new understanding (i.e. semantic change in the process of invited inference) and helps disseminating this new understanding further with the use of **conventionalization of inplicature** (stage A3). We can provide the illustrations for this cognitive mechanism, for example, with the source meaning 'to listen': 'to listen' → 'to obey' #0034; 'to listen' → 'to agree' #9117; 'to listen' → 'curious' #9161 etc. This mechanism is employed when the listener concludes that the word is being used in the second meaning 'to obey', 'to agree', 'curious' etc.

3.3 Underlying factor of external motivation

Besides this, we can speak of the factor of **external motivation** if a real-world trigger, such as a ritual, taboo, or cultural practice is involved in the shift (often together with "situational metonymy"). Of course, the factor of external motivation plays its role in any semantic extension by anchoring linguistic meaning to the extralinguistic world. The only question is to what extent it manifests itself in the shift we study. Even in the cases of temporal metonymy, such as the semantic relationship #1007 sun ↔ day and #00856 'moon' → 'month', the meaning extension rely entirely on external, real-world knowledge of planetary realities and lunar cycles.

At the same time, there are semantic shifs that cannot be explained without the factor of external motivation and the knowledge deeply rooted in the history, culture, and the realities of the physical world. Thus, the practice of worship a smallpox goddess in Dravidian history explains the shift 'mother' → 'smallpox' #5045 with realizations in Tamil *ammai*, Gondi *avval*. Sometimes the case of semantic shift may be based on a single historical event, such as the seating arrangement of parties in the French Parliament: left (vs. right) → left (political) #5613 etc.

4 Cognitive mechanisms and limitations of the analysis

Thus, we arrive at a list of relationships between lexical meanings connected by semantic shifts based on cognitive mechanisms. A person (first Speaker) undertakes an act of lexical creativity when launching a semantic shift, at the first stage A1 of semantic extension (see also Brochhagen et al., 2023 on lexical creativity). After the initial use, other mechanisms associated with social interaction (stages A2 and A3) are activated to support and disseminate the new meaning.

It is important to acknowledge the limitations of this kind of analysis. The findings presented here are the result of a reconstruction, and in some instances the data allows for alternative interpretations. Besides, multiple cognitive operations are often used at the same time. For example, a metonymic cognitive mechanism may be triggered by appearance similarity, not only by external motivation; a case of syncretism may include appearance similarity, and so on. Let's consider the shift #9842, 'to give birth' → 'to lay eggs', it can be interpreted as a metaphorical comparison with a bird laying eggs, as a metonymic temporal contiguity of situations, or as a hypo- and hypernym connection.

5 The most frequent patterns attested in the DatSemShift database

For the purposes of quantitative analysis, I examined the first 300 semantic shift in the DatSemShift database with the highest number of realizations, and classified them according to their cognitive mechanism of semantic change. The first 20 shifts with highest number of realizations in the database are given in Table 1.

The cases of "classical" metonymy predominate among the semantic shifts with the greatest number of realizations in DatSemShift, as shown in Table 1, where 13 cases of metonymical shift out of 20 are recorded. These cases include such shifts as 'moon' → 'month', which represent temporal contiguity and a cognitive mechanism of metonymy; the same for the shift 'sun' ↔ 'day' and morning ↔ tomorrow. The cases based on the metonymical cognitive process include also part-whole and hypo-hyperonym connection, as in woman ↔ wife. Instances of appearance similarity, metaphor, and "situational" metonymy are also attested, though less frequently. There are cases of metaphorical extension: straight → correct, right; to hear / to listen → to understand etc, but these cases are rare.

ID	Meaning 1	Direction	Meaning 2	Cognitive mechanism
00856	moon	→	month	Metonymy, temporal
01007	sun	↔[3]	day	Metonymy, temporal
00034	to hear / to listen	→	to obey	Metonymy, situational
00575	girl	↔	daughter	Hyponym–hyperonym metonymy
00563	man (male)	↔	human, person	Hyponym–hyperonym metonymy
00966	woman	↔	wife	Hyponym–hyperonym metonymy
00933	man (male)	↔	husband	Hyponym–hyperonym metonymy
01171	heart	↔	seat of emotions	Metaphorical extension
00068	morning	↔	tomorrow	Metonymy, temporal
04786	milk	↔	female breast	Metonymy, spatial
03954	word	—	language	Metonymy, part-whole
02691	mouse	↔	rat	Appearance similarity, co-hyponyms
00061	straight	→	correct, right	Metaphorical extension
01985	silver	↔	money	Metonymy, material-based
00710	in front of	→	before (temporal)	Metaphorical extension
01005	head	→	chief, boss	Metaphorical extension
00436	lip	→	mouth	Metonymy, spatial
02372	day	→	24 hours	Metonymy, temporal
05066	grandchild	—	grandparent	Metonymy, situational, with external motivation (habits and rituals)
00018	to hear / to listen	→	to understand	Metaphorical extension

Table 1. Top-20 semantic shift with highest number of realizations in DatSemShift 3.0 and their cognitive mechanism

This distribution probably reflects the current stage of the project development. A comparison with data from other databases and from quantitatively balanced sources would be the subject for future research.

For this reason I checked the data in other databases containing related records. In particular, the cognitive mechanisms of metonymy predominate within the 20 most common colexifications in the CLICS database, cf. (Rzymsky et al. 2020:5): wood — tree, moon — month, fingernail — claw, leg — foot, knife (for eating) — knife, son-in-law (of man) — son-in-law (of woman), skin — bark, word — language, arm — hand, listen — hear, meat — flesh, daughter-in-law (of woman) — daughter-in-law (of man), skin — leather, blue — green, male (of animal) — male (of person), woman

[3] The double-headed arrow indicates that there are both directions among the realizations of the shift (cf. Rousseau 2019).

— wife, dish — plate, female (of person) — female (of animal), earth (soil) — land, path — road. In fact, only 3 cases among the most common instances of the CLICS database repeat the Datsemshift data, these cases are: moon — month, woman — wife, word — language. However, in both projects, the predominant cognitive mechanism for the most described cases is metonymy.

6 Conclusion

This paper examines semantic shifts in the DatSemShift 3.0 database, suggesting a reconstruction of the cognitive mechanisms involved in the stages of the process of semantic extension. Furthermore, the paper addresses the question of whether metonymy is the most prevalent cognitive mechanism. The following stages of semantic shift are distinguished: **A0:** The preliminary stage, in which the source lexical meaning is considered alongside all its usage situation. **A1:** The first cognitive action of the first Speaker. **A2:** The first cognitive action of the first Listener (invited inference); **A3:** The stage of further dissemination (conventionalization of implicature). The factor of external motivation is also considered.

Within the first cognitive action of the first Speaker (stage **A1**, the lexical creativity transfer) the following four cognitive mechanisms are distinguished: the transfer based on the cognitive mechanism of appearance similarity, metaphorical extension, “classical” metonymic extension and “situational” metonymy.

Having examined the 300 most well-described shifts in the DatSemShift 3.0 data, I found that metonymy of various types was the most common mechanism here, followed by metaphorical extension. Further research into frequency analysis will be needed when balanced corpora of semantic shifts are available.

The semantic shifts are the result of processes that unfold over decades or even centuries. Each one originates in an act of linguistic creativity of the first Speaker, reflecting a cognitive operation “in constant flux driven by external factors such as cultural, societal and technological changes, as well as by internal motivations” (Tahmasebi et al, 2019). If understood by the first Listener and conventionalized by others, such innovations stabilize within the speech community and may ultimately become established lexical meanings, later documented in dictionaries.

Semantic shifts therefore tend to develop slowly, and the connections between lexical meanings preserved this way may encode aspects of cultural and linguistic realities of distant past. In this sense, DatSemShift is a unique continuously expanding resource for investigating historical cognitive patterns as reflected in lexical change.

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