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Polysemous Qualities and Universal Networks, Invariance and Diversity

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The topic of this paper is the conceptual organization of polysemous prototypical qualities. This study, based on data collected in 24 languages, makes use of a single notional space composed of 110 notions. This space enables us to separately represent the polysemies observed in each language as well as polysemous patterns observable in several languages in order to contrast the variability specific to each language with the linguistic invariance. The results show that what is common in the language sample is based on recurring polysemies organized in networks. This method will also be useful in explaining how the linguistic variability is built up. Indeed, some of the qualities involved in these networks always take part in polysemous associations specific to only one language. Such qualities, called federative notions, are characterized by the fact that they are regularly involved in polysemous patterns, and across numerous languages.

1. Introduction

The purpose of this article is to provide an analysis of the semantic organization of qualities involved in polysemous patterns. Following a joint study[1] on the typology of adjectives and qualification in twenty-two African languages, to which I added French and English, this paper is an attempt to apply the semantic map method to represent the polysemous patterns of quality expressions.

It will be shown that what is common between the semantic maps of the language sample is not exactly a high number of *recurring* polysemous patterns observable in other languages but rather the existence of underlying cognitive frameworks. These frameworks called *universal networks* (see Section 4.1.) form the level of invariance on which the recurring polysemies are built up.

It is also an attempt to apply this method to language specific polysemous patterns and to explain how these *unique* polysemous patterns are made up. These patterns are characterized by two properties: (i) they are found in only one language of the sample and (ii) they almost always involve at least one quality, called *federative notion*, which is characterized by a particular semantic behavior. Indeed, these federative notions are defined by the fact that they are regularly involved in polysemous patterns, across numerous languages (see Section 4.2.); e.g., the federative notion [A] occurs in various unique polysemous patterns (e.g. [A, B], [A, C]) to which may be added recurring patterns cross-linguistically (e.g. [A, D], [A, E]).

After a short presentation of the language data and the theoretical framework (Section 2), this article will then examine and discuss a sample of the semantic maps, highlighting both recurring polysemous patterns and unique polysemous patterns (Section 3). The paper will aim at explaining the linguistic variability, which hinges on the semantic and cognitive invariance (Section 4), and the major principles involved in the elaboration of each semantic map (Section

[1]PICS n° 2425 (2004-2006): "Typologie des adjectifs et de la qualification dans les langues africaines" Llacan (Langage, Langues et Cultures d'Afrique Noire – CNRS) / Universität Bayreuth (Afrikanistik I & II). The collaboration regarding the semantic study of polysemous qualities involved Dymitr Ibriszimow, Eva Rothmaler and Holger Tröbs (University of Bayreuth), Loïc-M. Perrin and Paulette Roulon (Llacan-CNRS).

5). Section 6 will conclude with a comparison between the semantic organization of the polysemous qualities and Lazard's (1992) approach to spatial organization and grammaticalization phenomena.

2. Language Sample and Data

2.1 Composition of the corpus

The study is based on a sample of twenty-four languages including twenty-one African languages, one Spanish and Kikongo based Creole, and two Indo-European languages, as presented in Table 1.

Kabyle	Berber (Afro-Asiatic)	**Tigre**	Semitic (Afro-Asiatic)
Tachelhit	Berber (Afro-Asiatic)	**Zaar**	Chadic (Afro-Asiatic)
Tamahak	Berber (Afro-Asiatic)	**Hausa**	Chadic (Afro-Asiatic)
Afar	Cushitic (Afro-Asiatic)	**Kisi**	Bantu (Niger-Congo)
Jola	Atlantic (Niger-Congo)	**Bijogo**	Atlantic (Niger-Congo)
Balante	Atlantic (Niger-Congo)	**Wolof**	Atlantic (Niger-Congo)
Gbaya	Ubangi (Niger-Congo)	**Zulu**	Bantu (Niger-Congo)
Cerma	Gur (Niger-Congo)	**Nateni**	Gur (Niger-Congo)
Tigemaxo	Mande (Niger-Congo)	**Bambara**	Mande (Niger-Congo)
Chamba Daka	Bueno-Congo (Niger-Congo)	**Kanuri**	Saharan (Nilo-Saharan)
Yulu	Central Sudanic (Nilo-Saharan)	**Palenquero**	Creole (Spanish based)
French	Italic (Indo-European)	**English**	Germanic (Indo-Europ.)

Table 1: Language sample

The data itself contains 110 qualitative concepts (see Appendix 1). In order to avoid ambiguities due to the polysemy of some English lexical items, French or German have been used instead. For example, the English word *sharp* can characterize something that has a pointed end as well as something that cuts easily. So, in this case, the German word SPITZ was used to designate the fact that something has a pointed end, and the word SHARP was retained to designate something that cuts easily.

At the beginning, we drew up a corpus composed of 113 qualitative notions. The selection of the qualitative notions was based on the list of prototypical qualities given by Dixon (2004:3-5), with the exception of color which constitute a particular system[2] in some African languages. It should be remembered that Dixon distinguishes two kinds of semantic types typically associated with the adjective class (see Table 2). The first one is relative to four core semantic types, which are typically associated with both large and small adjective classes, and the second one is relative

[2]Actually, such systems are defined by the fact that they mix the concept of color with the concept of brightness.

to three peripheral semantic types, which are typically associated with medium-sized and large adjective classes:

	Core semantic types
Dimension	big, small, long, short, wide, deep...
Age	new, young, old...
Value	good, bad, lovely, atrocious, perfect, odd, strange, curious, necessary, crucial, important, lucky...
Color	black, white, red...

	Peripheral semantic types
Physical property	hard, soft, heavy, wet, rough, strong, clean, hot, sour; well, sick, tired, dead, absent...
Human propensity	jealous, happy, clever, generous, cruel, proud, ashamed, eager...
Speed	fast, quick, slow...

Table 2: Dixon's semantic types associated with the adjective class

It does not seem that this opposition is significant in the present study. Each observation presented in this paper concerns notions relative to core semantic types as well as peripheral ones, without distinctions.

The polysemous connections in the above-mentioned qualitative notions were observed in all 24 languages of the sample. A further nine notions had to be added because they occurred at least twice in polysemous patterns in the language sample. For example, we added the notion ACID because sixteen languages contain the pattern SOUR/ACID. Similarly, we added the notion CALM since it is involved in two different polysemous patterns: CALM/COLD in Bijogo and CALM/SOLID in Yulu. These additions concerned the following notions: ACID, CALM, CONSTANT, COWARDLY, FREQUENT, MAIGRE, NASTY, SALT, and SUPERFICIAL. Moreover, we also removed from the initial data the few qualitative notions which were never involved in a polysemy (HARD-WORKER, MULTICOLOURED, WHOLE, SQUARE) as well as those which were part of a marginal polysemous pattern (that is a pattern occurring in only one language and containing a notion which does not appear in the initial corpus). This concerns the notions UGLY, HUNGRY, DRUNK, JEALOUS, ACTIVE, DARK, RUSTY and THIRSTY. Thus, some fifteen polysemous patterns were not taken into consideration in the database.[3]

In the language sample, 256 polysemous patterns were found (see Appendix 2). 148 of them are particular to one language, 7 are shared by a minimum of 10 (up to 16) languages, and 16 are shared by 5 to 9 languages. Thus, polysemies which are language specific are more numerous than those attested cross-linguistically (roughly, 58% *vs.* 42%).

2.2 Theoretical framework concerning the notion of "polysemy"

By "polysemy" one usually refers to the fact that a same form is used to refer to two (or more than two) different notions. From a synchronic viewpoint, one can distinguish two kinds of polysemous phenomena: synonymy and strict polysemy (Jacquet et al. 2005). *Synonymy* is used

[3]Especially for constraints relating to the organization of the semantic maps space.

whenever the different meanings of a polysemous word can be express by another word, as illustrated in Figure 1:

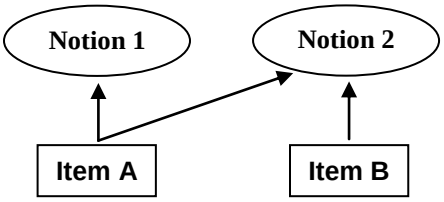


Figure 1: Schematic structure and examples of synonymy

Examples:

(1) *sec* (fr.): a. 'no water or moisture (DRY)'; b. 'low fat-thin (MAIGRE)', syn. *maigre* in French
   a. Un manteau sec (a *dry* coat)
   b. Un homme sec (lit. a *dry* man) ⇔ Un homme maigre (a *thin* man)

(2) ACID/SOUR (two synonyms in French, English…)
   a. These wines taste *sour* ⇔ these wines taste *acidic*
   b. Ces vins ont un goût *aigre* ⇔ Ces vins ont un goût *acide*

One talks about *strict* polysemy whenever there is no other word (no synonym) able to express the different meanings of a polysemous word (see Figure 2).

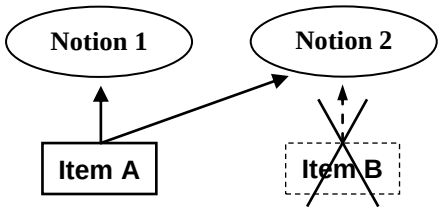


Figure 2: Schematic structure and examples of strict polysemy

Example:

(3) *nooy* (Wolof), *soft* (English)
   a. pleasant to touch (DOUX/French)
   b. Not hard (MOU/French)

The fact that a language uses the same word to refer to different notions, while other languages use different words, seems to prove that this language resorted to a polysemous process. Conversely, the fact that no language uses different words for two distinct notions seems to prove that an analysis in terms of separate representations is difficult (Haspelmath 2003:239). Among the one hundred and ten qualitative notions, it is always possible to observe two different notions unconnected in one language but which may be involved in a polysemous pattern in at least one other language. For example, even if the polysemous pattern ACID/SOUR occurs in sixteen languages, there are eight languages in which there is no specific word for the expression of these two notions simultaneously. It is thus possible to assume that each qualitative notion used in the corpus is vindicated.

All the polysemies referenced in the database were collected from dictionaries as well as from responses elicited from native speakers by linguists who are specialists in the languages investigated. But, it is clear that the number of polysemies observed in each language is debatable. For instance, the study which I carried out on Wolof and French (my native language) shows three times more polysemies in French (see Figure 5) than in Wolof (see Appendix 3d). One could also compare the *Trésor de la langue Française*[4], which gives more than thirty synonyms for the notion DRY in French, whereas the French semantic map given in the present paper contains only two patterns. This variation is related to the degree of specificity of the meanings developed by a polysemous word. Indeed, following Jacquet et al. (2005), the different meanings of a polysemous word are only valid in a limited set of contexts. And the more numerous and varied the contexts, the less the meaning is specific. For example, the word *sec* (DRY) in French is synonymous with STINGY only when describing a person. But *sec* can also describe a low-fat (MAIGRE) entity, for instance a person, a diet, etc. Therefore, the pattern DRY/MAIGRE is more salient than the pattern DRY/STINGY in French. Nevertheless, one can consider the data valid insofar as the observed regularities only concern the salient polysemous patterns.

It is necessary to specify what is understood by "universal" in this paper. In order to account for the organization of the polysemous qualities, a pattern is considered as universally polysemous if it tends to be recurring across languages and cultures in more than two different languages. "Universal" is not defined by a systematic rule (remember that the so-called "universals" in typology always have exceptions), but by a tendency, or at best a potentiality, based on the observation of actual recurring polysemous patterns attested in the data.

A pattern recurring only twice in the language sample could be considered the result of a sheer coincidence or the result of a single polysemous process. In the latter case, one can posit that what is significant from a cognitive viewpoint is the fact that two different peoples with two different cultures, having had no contact whatsoever, have developed the same cognitive and linguistic process (metaphor, metonymy, generalization of a signified, specialization of a signified, cohyponymic transfer—Blank 2000; Koch 2000 & 2004). Whether such a capacity was developed in a few or many languages is not what is at stake: some universal phenomenon may be more recurring than others.

In order to reduce the possibility of the sheer coincidence of polysemous patterns but not to leave aside less recurring polysemous patterns, it seemed reasonable to limit the present study to patterns recurring at least three times cross-linguistically. Note that this is a working hypothesis to be further tested with in-depth studies on the basis of areal and genetic distributions. The consequence of such a methodological approach is that the more recurring a phenomenon, the higher its potential universality.

2.3 About the semantic maps

The polysemous connection between concepts is represented by means of a line linking them together. The schema (the diagram) thus obtained symbolizes the semantic network, the semantic map, of the polysemous connections as observed in a particular language. The notions are organized on the map so as to bring close together the most frequent polysemous patterns attested in the data cross-linguistically and make visible the network that they build. This

[4]The *Trésor de la Langue Française* (TLF) is a large 16 volume dictionary of the French language, published by the Institut National de la Langue Française (INaLF, former laboratory of the C.N.R.S.)

organisation does not imply that the physical closeness between notions on the semantic maps is significant. Only the links matter—for practical reasons, it was impossible to represent the semantic proximity according to closeness on the semantic map when some qualitative notions are involved in up to thirteen different polysemous patterns. Furthermore, it must be kept in mind that the qualitative notions related to each other on the map are not necessarily expressed by the same word in each language; they may also represent two polysemous words having the same notion in common.

3. Presentation of the Semantic Maps

To start with, a sample of six semantic maps will be presented and discussed from two points of view: (i) the polysemous networks of each language and the quantitative specificities relative to the contrasting opposition "unique" vs. "recurring"; (ii) the possible genetic or areal (borrowing) bias of some polysemous patterns.

3.1 Diversity and invariance from a qualitative viewpoint

The semantic maps presented in this paper represent the semantic associations[5] observed in six languages: Bambara (Figure 4), French (Figure 5), Cerma, Gbaya, Jola, and Wolof (see Appendix 3a-d). It is not necessary to present all the semantic maps because there is no semantic map which looks like another, even partly. It simply seems that there are a number of invariants, i.e., polysemous patterns that can be observed in several languages.

This also holds true for genetically related languages. If it is not debatable that genetically related languages may share polysemies, we think that this phenomenon is very rare. Let us take the case of the Wolof and Jola semantic maps (see Appendix 3c-d). Figure 3 represents the polysemous associations observed simultaneously in both languages (the red lines represent the patterns shared by both languages, the black ones the patterns observed only in Wolof, and the blue ones the patterns observed only in Jola). These two African languages both belong to the Atlantic North sub-group and are geographically close (both are spoken in Senegal); moreover, Wolof is the major vehicular language spoken by over 80% of the Senegalese population including some of the Jola people. Nevertheless, even though some semantic associations shared by both languages may imply genetic and/or areal features, the semantic maps for each language are really very different. In fact, there are only four patterns which are shared simultaneously by these two languages: ACID/SOUR, GOOD/GENEROUS, LITTLE/SMALL, and FULL/NUMEROUS.

[5]At this point, the links' colors are not important.

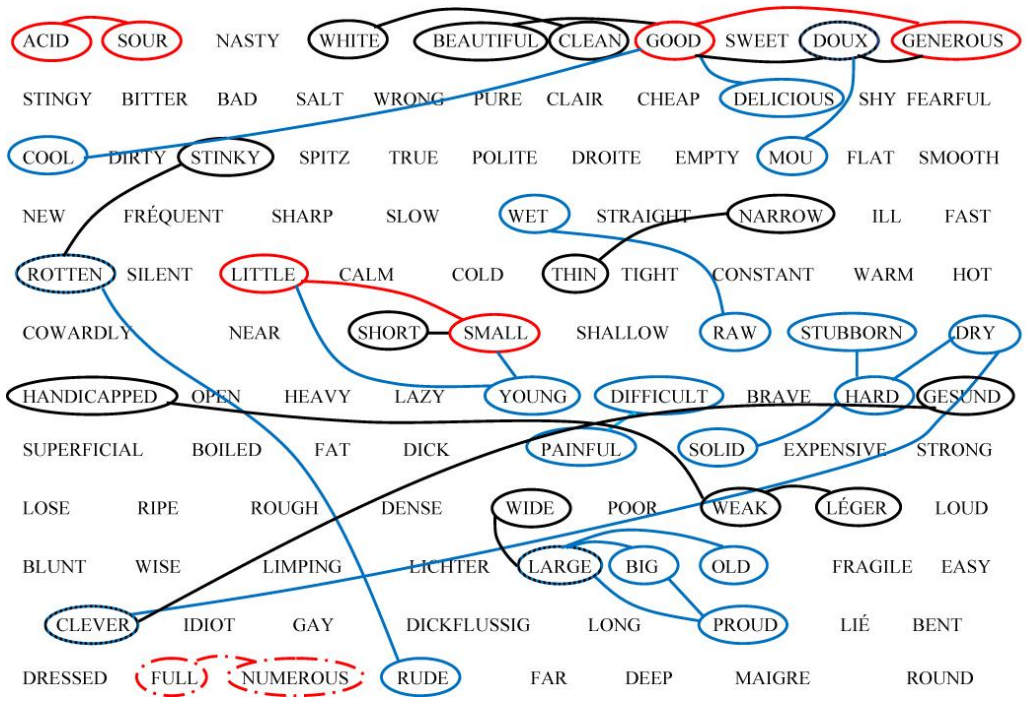


Figure 3: Wolof and Jola semantic map

On all the semantic maps, the polysemous patterns observed in a minimum of two languages are marked in red bold (e.g. on Figure 4, the pattern SLOW/COLD occurring in Bambara can also be observed in four other languages).

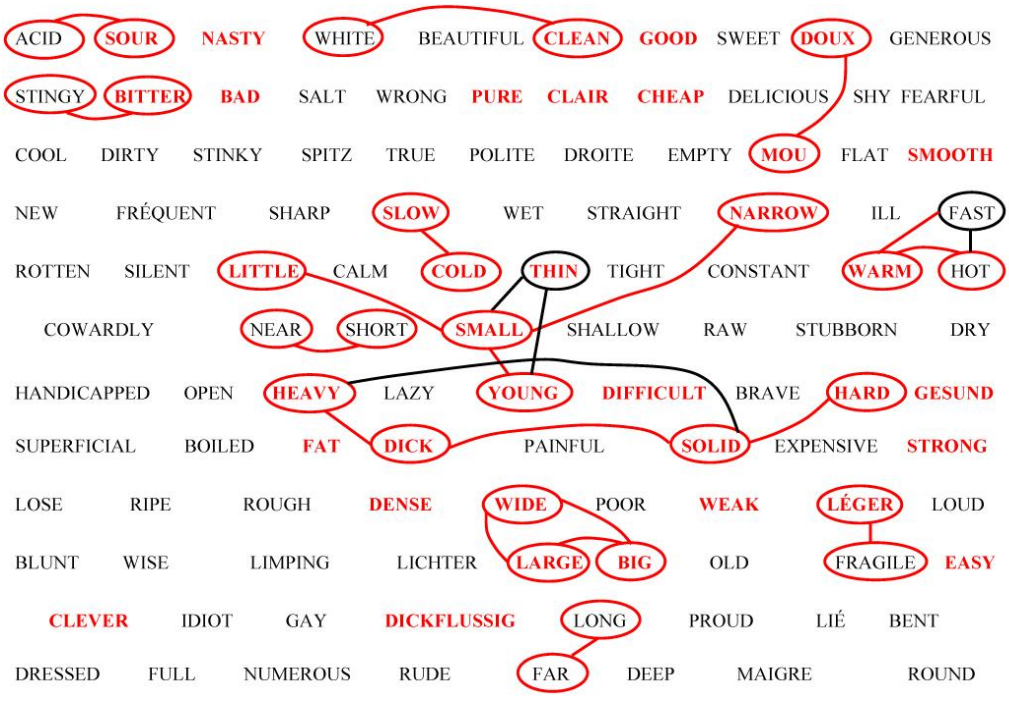
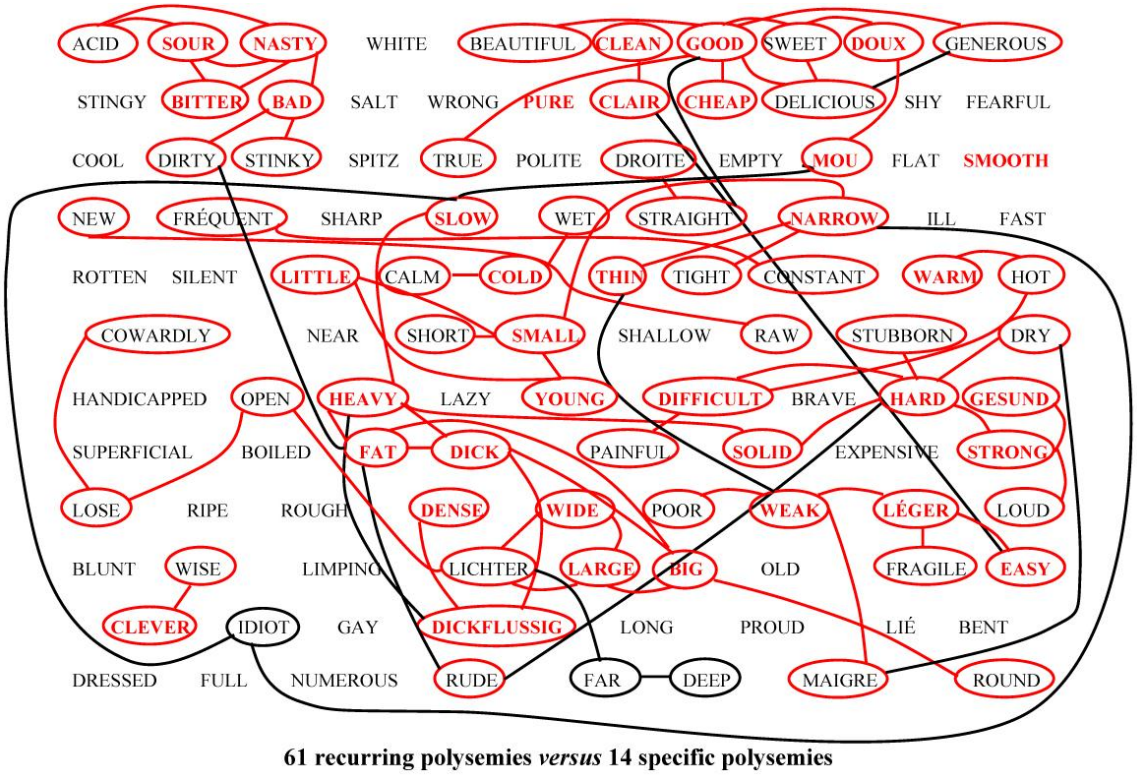


Figure 4: Bambara semantic map

And patterns specific to one language are in black. Following the Bambara semantic map's example, it can be observed that polysemies particular to Bambara only (FAST/HOT, THIN/YOUNG, THIN/SMALL and HEAVY/SOLID) are scarce as compared with the nineteen polysemies[6] also observable in other languages in the database. This remark applies to the five other languages discussed in this section and holds true for all the languages of the corpus (see Appendix 3a-d) including the two Indo-European ones (see Figure 5)—each semantic map shows more recurring patterns than specific patterns.



61 recurring polysemies *versus* 14 specific polysemies

Figure 5: French semantic map

3.2 Diversity and invariance from a quantitative viewpoint

Whereas most of the semantic patterns of a language can be observed in other languages, still 58% of all conceptual pairs in the database are specific to only one language (148 specific polysemies *vs.* 108 recurring polysemies, see Appendix 2). In other words, the majority of the polysemous patterns observed for each language are recurring associations cross-linguistically—in fact, 3/4 on average—while there is a majority of particular semantic associations in the database. These are only outward discrepancies. They are due to the fact that the recurrence of some polysemous patterns is so important that all languages are concerned: each language has an average of 6 specific polysemies (148 polysemies for 24 languages), i.e., one fourth of the polysemies observed on each semantic map, but, although only 18 polysemous patterns are shared by 4 languages (7 % of the database), each language contains an average of 3 polysemies

[6]ACID/SOUR, STINGY/BITTER, WHITE/CLEAN, DOUX/MOU, NEAR/SHORT, LITTLE/SMALL, SLOW/COLD, SMALL /NARROW, WARM/HOT, WARM/FAST, SMALL/YOUNG, HEAVY/DICK, DICK/SOLID, SOLID/HARD, WIDE/LARGE, WIDE/BIG, BIG/LARGE, LÉGER/FRAGILE, and FAR/LONG.

observable in 4 languages (72 polysemies for 24 languages).

A quantitative comparison between two genetically and areally close languages highlights the problems linked to polysemous patterns, which may be due to genetic and/or borrowing reasons. For instance, the four polysemous connections[7] common to Wolof and Jola can also be observed in other languages of the corpus, but only FULL/NUMEROUS is attested in another Atlantic language, namely Bijogo.

Among the 256 polysemies attested in the database, only two patterns may be explained by a genetic reason: FULL/NUMEROUS in the three Atlantic languages (Bijogo, Jola, and Wolof), EXPENSIVE/HARD in the two Gur languages (Cerma and Nateni).

As for polysemies due to borrowings in the case of geographical proximity, African languages only count six polysemous patterns that may be linked to areal factors (in some cases in addition to genetic factors): COLD/WET and EXPENSIVE/HARD (Cerma, Nateni), COLD/SLOW (Cerma, Nateni, Bambara, Tigemaxo), WHITE/CLEAN (Jola, Balante, Bambara), DICK/SOLID (Bambara, Balante), and BIG/ROUND (Yulu, Gbaya). Just as we assumed that a polysemous pattern shared by only two languages has one chance out of two of being the result of the same linguistic and cognitive process, there is no evidence to help one decide whether these semantic connections are due to universal, genetic, or areal factors. In consequence, these eight polysemous patterns represent the error margin.

Of course the number of possible borrowed polysemies increases a bit if one takes French and English into consideration since both languages are also spoken in almost all the African countries (but to various extents according to particular socio-linguistic situations and to speakers); the quantitative data might not be significant any more. For example, the pattern BIG/ROUND in Gbaya (see Appendix 3b) and Yulu[8] also occurs in French[9] (see Figure 5) and could be attributed to a borrowing from French. Still, we think that the sample of African languages is representative enough of this kind of genetic phenomenon.

One could add that lexical borrowing as well as polysemy are generally the consequence of a lexical gap—a language has no word to designate an entity or a concept (Choi 2001). Moreover, even if a polysemous pattern is borrowed from another language, this pattern is initially triggered by a particular linguistic and cognitive process; it is thus highly probable that speakers re-conceptualized the borrowed polysemous connection because of its lexical salience. Still, even if we do not question the hypothesis of genetically shared or borrowed polysemies, we think that they are marginal and cannot invalidate our working hypothesis.

4. Universal Polysemous Networks & Federative Notions

We will now deal with the representation of notional space for conceptual facts observable in several languages. We call *conceptual map* the spatial representation which enables us to represent polysemous patterns shared by several languages. The purpose is to highlight (i) the existence of networks made of recurring polysemous patterns, and (ii) the existence of qualitative notions which are regularly involved in polysemous patterns and across many languages. Furthermore, we will also take up a position on the psychological interpretation of the presented networks.

[7] ACID/SOUR, GOOD/GENEROUS, LITTLE/SMALL, and FULL/NUMEROUS.
[8] These two languages are spoken in the Central African Republic.
[9] "une femme ronde": *a big lady* (lit. *a round lady*).

4.1 Recurring polysemous patterns and universal networks

The conceptual map presented in Figure 6 represents the recurring associations observed in at least three languages. The patterns shared by only three languages are represented by dotted lines, and the patterns shared by a minimum of four languages are represented by full lines. It can be observed, with very few exceptions, that the notions involved in these recurring patterns do not form a set of separate pairs but are organized in networks in the sense that these notions are related to each other. The polysemous patterns observed in three languages only are also significant since they do not change anything in the principle of networks—most of the three-languages patterns are related to a pattern shared by a minimum of four languages. So, despite the fact that these semantic patterns imply a margin of error, they show that patterns with a low frequency of occurrence seem also to be built on notions involved in universal networks.

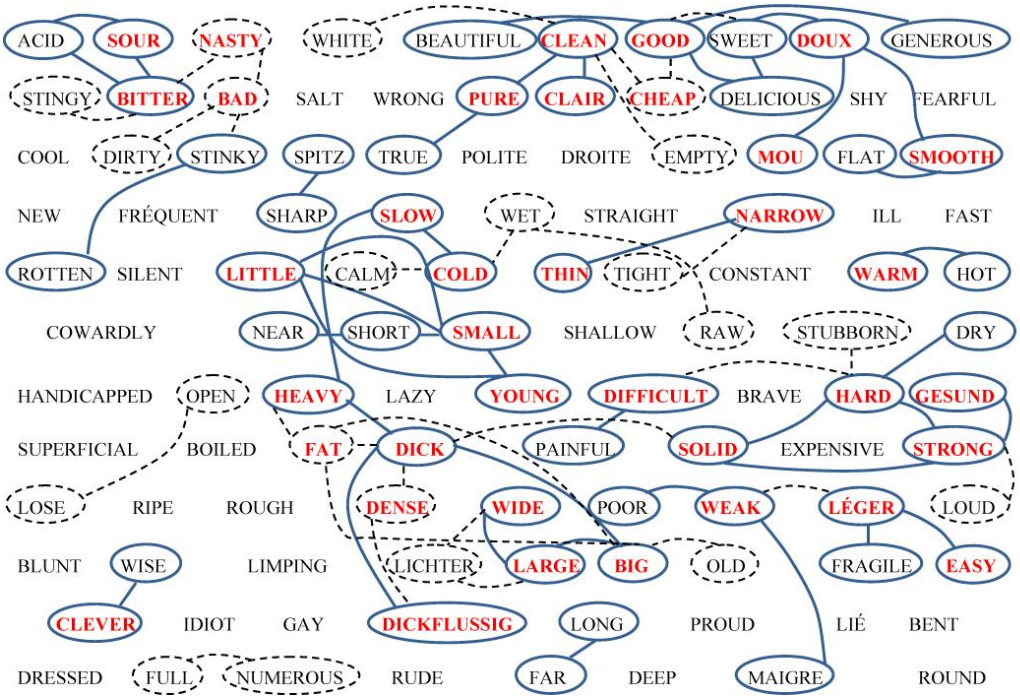


Figure 6: Conceptual map

The universal polysemous networks may explain what is common between each semantic map. Nevertheless, it is impossible to decide on the mental reality of such cognitive networks, or on the mental reality of the semantic maps. In order to prove such assumptions, we would first have to define what a mental reality is—is it related to the cultural representations shared by native speakers or is it related to metalinguistic representations built by linguists, or both?

Whatever the answer, the fact that some qualitative notions are organized in networks does not mean that these networks reflect a pre-conceptual organization. "Network" here refers to the fact that some concepts are related to each other within the framework of polysemous connections, nothing else. Still, we can at least suppose that these recurring polysemous connections hinge on common conceptual reasoning based on basic cognitive experiences, potentially shared by each individual. In our opinion, these universal networks can indeed be assimilated to a potential stock of polysemies. But this does not mean that all speakers share all these connections in their minds. Actually, these patterns are based on universal cognitive abilities which can be developed very

easily but which may also be hidden. The present study cannot explain why each language chooses certain recurring patterns rather than others.

4.2 Polysemous valence and federative notions

It is now necessary to introduce a new concept called the *polysemous valence* of a notion. In other words, the question is to determine the number of polysemous connections that a quality may involve whatever the number of languages concerned. For example, the notion GAY is connected to only one notion: it occurs in the pattern GAY/PROUD only observed in Cerma; so the number of polysemous valence of GAY is 1. The notion ACID has a polysemous valence of 4 since it can occur in four different patterns (see Figure 7). One of them, ACID/SALT, occurs in only one language—Bijogo; but the others can be observed in a minimum of two languages: ACID/SOUR (16 languages), ACID/BITTER (4 languages), and ACID/NASTY (2 languages).

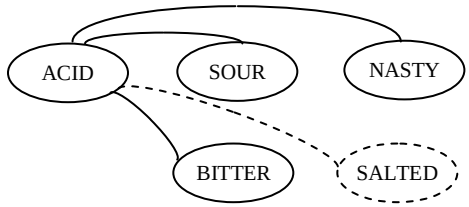


Figure 7: Polysemous patterns shared by the notion ACID

Similarly, the polysemous valence of HARD is 13 since this notion is involved in 9 patterns shared by up to 10 languages, as well as in 4 patterns specific to only one language.[10]

With such a method, we can bring out the notions that are often involved in semantic patterns (even if it is not a recurring polysemous pair) and those which are involved in only one semantic pattern, as Table 3 shows.

[10]See Figure 8 in Section 5.1.

Polysemous notions	Valence
hard, dick	13
Weak	12
solid, cold, good	11
strong, big, doux, narrow	10
dickflüssig, gesund, slow, bad	9
wide, easy, heavy, cheap, difficult, léger	8
clean, bitter, fat, pure, mou, expensive, *thin*	7
warm, clair, dense, large, small, sour, nasty, smooth, wet, rude, *little*	6
young, empty, delicious, *clever*, lichter, sweet, calm, poor, straight	5
short, acid, beautiful, white, shallow, stingy, fragile, deep, dirty, true, raw, idiot	4
brave, hot, constant, boiled, lose, proud, long, open, rotten, wise, sharp, near, round, frequent, ill, salt, far, maigre, rough, dry	3
droite, ripe, generous, stinky, fast, silent, old, spitz, wrong, handicapped, polite, lazy, painful, stubborn, shy, fearful	2
flat, cool, bent, blunt, dressed, lié, full, limping, numerous, new, gay, loud, stubborn, tight	1

Table 3: Valence and polysemous notions

A second important principle is called *federative notions*. These are notions defined by two properties: the number of polysemous valences as well as the number of languages concerned by these various connections. We can thus eliminate notions for which the polysemous valence is not really meaningful since the semantic connections are only limited to a few languages. For example, the notion EXPENSIVE is involved in seven patterns which only occur in four languages; CLEVER though only occurs in five different patterns but across eleven languages.

From a quantitative viewpoint, we limited the set of federative qualities which are involved in a minimum of five polysemous patterns and across a minimum of six languages. These are SOUR, NASTY, CLEAN, GOOD, DOUX, BITTER, BAD, PURE, CLAIR, CHEAP, MOU, NARROW, WARM, SMALL, LITTLE, HEAVY, YOUNG, DIFFICULT, HARD, GESUND, FAT, DICK, DICKFLUSSIG, SOLID, STRONG, SMOOTH, COLD, DENSE, WIDE, WEAK, LÉGER, LARGE, BIG, EASY, THIN, CLEVER, and SLOW (italicized in Table 3).

Finally, in Figure 6, we contrasted the federative notions (written in bold red) with the universal cognitive networks. Most of the federative notions are involved in networks shared by a minimum of four languages. Only five federative notions occur in a network shared by three languages: NASTY, BAD, CHEAP, FAT, and DENSE.

5. From the Invariance to the Diversity

The spatial representations of polysemous patterns for each language (by means of semantic maps) as well as the patterns shared by several languages (by means of a conceptual map) proved to be very useful in bringing out a certain number of regularities concerning the organization of the semantic maps.

Considering such regularities, we will try and understand how the linguistic variability hinges on the invariance in order to model the organization of polysemous patterns represented

in each semantic map. In other words, we will account for the correlation between the cognitive networks and the federative notions on the one hand, and the varied semantic maps built by languages on the other hand.

5.1 Organisation and elaboration of the semantic maps

In order to prove this assumption, we will contrast the federative notions on each semantic map (in bold red type above) by means of maps. The federative notions are of consequence in the organization of these semantic networks in the sense that whenever a particular pattern occurs (represented by a black line), it almost always involves a federative notion (82% of the polysemies specific to only one language).

So, from a dynamic viewpoint, we can assume that whenever a quality is involved in recurring polysemies, and if this quality is a federative notion, then this quality should occur in other polysemous patterns specific to a particular language.

To illustrate the fact that the federative notions have a major impact on the creation of each semantic map, let us take the case of the federative notion HARD which is involved in thirteen polysemous patterns, as illustrated in Figure 8.

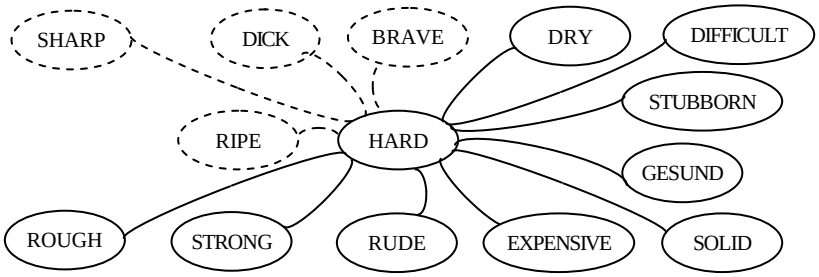


Figure 8: Polysemous patterns shared by the notion HARD

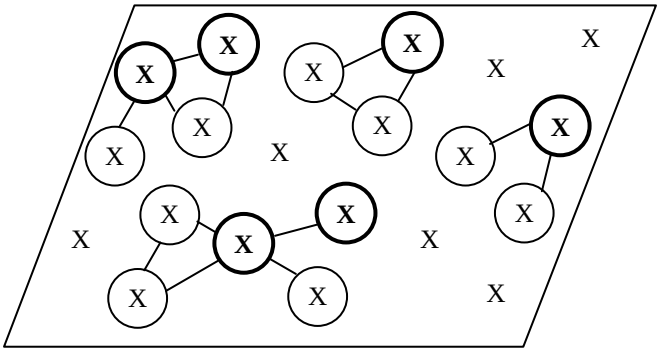
Since this notion occurs in a universal network (see Figure 6), we should observe numerous languages which contain some of the nine recurring patterns involving the notion HARD (the connections in full lines in the above schema). But since the polysemous valence of HARD is 13, this notion also occurs in four other patterns which are particular to one language (the connections in dotted lines).

So, we can conclude that a quality which is a "federative notion" takes part in a universal network and may occur in one or several polysemous patterns observable in only one language.

The federative notions enable us to understand how the interaction between these levels of invariance (the universal networks and the federative notions) and the linguistic variability is built. In fact, the federative notions form the hard core of the universal networks, and all the other patterns, especially those which are unique, are built from these federative notions. Besides, we previously observed a similar semantic phenomenon when we noticed that most of the patterns shared by three languages were built on notions involved in the universal networks.

5.2 Modeling

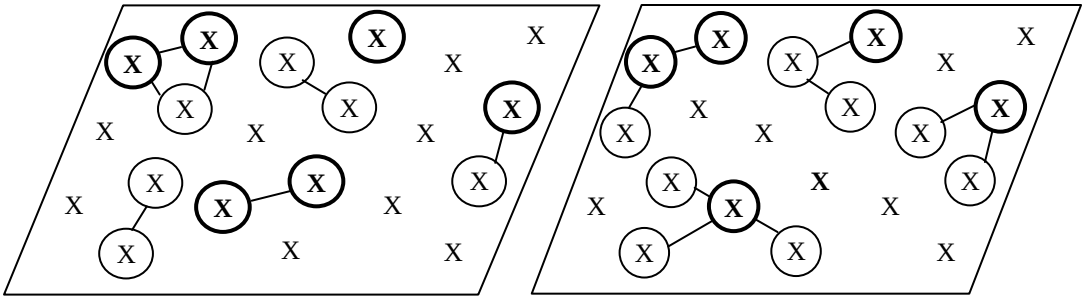
In order to sum up all these observations and to model the system related to the elaboration of semantic maps (i.e. to explain how both kinds of invariants organize the semantic maps of each language), we will use schemas symbolizing the interactions between the cognitive level (represented by the conceptual map) and the linguistic level (represented by the different semantic maps). So, at the cognitive level, between these miscellaneous qualities (symbolized by the letter 'X' in Figure 5), there are several universal networks based on common cognitive experiences and potentially shared by all speakers. And within these universal frameworks, we observed that some qualitative notions are more regularly involved in polysemous patterns than others—these are the federative notions (the letters 'X' in bold circles in Figure 9).



Conceptual Map

Figure 9: At the cognitive level

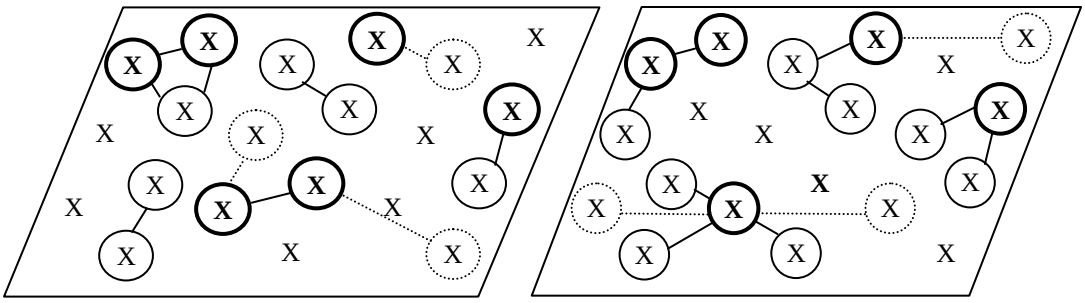
At the linguistic level, as a first stage, we can first notice on each semantic map some polysemous connections, which come out of the universal networks. But each language does not systematically resort to the same patterns, as illustrated in Figure 10a.



- Semantic Map 1. *- Semantic Map 2.*

Figure 10a: At the linguistic level *(Stage 1)*

As a second stage, some federative notions build particular polysemous connections specific to only one language (these are indicated by dotted lines on each semantic map in Figure 10b). So, we obtain two semantic maps different from each other.



- Semantic Map 1. *- Semantic Map 2.*

Figure 10b: At the linguistic level (*stage 2*)

6. Conclusions

To conclude this study, we would like to set some limits to our observations. Indeed, it is always possible to provide some patterns that go against our assumptions, e.g., the polysemies specific to only one language that do not involve a federative notion.[11] But counterexamples are relatively rare. Moreover, as we said previously, we do not claim that the presented modeling reflects some systematic rules, but rather it reflects some regularities. We also do not forget that these regularities, based on a small sample of qualitative concepts, could be refined in a larger sample.

This sample is made of a list of prototypical adjectives as given by Dixon (2004). So it is possible that the semantic behaviors that we modeled could be only specific to these notions. Other qualities, or even other kinds of concepts could give a different result.

Nevertheless, the presented regularities seem to prove the existence of several conceptual sets organized into networks and which are independent of the linguistic variability. These networks are based on linguistic and cognitive processes that can be easily developed (*i.e.* potentially shared by numerous languages). They seem to form the universal framework of the recurring polysemies. Furthermore, the fact that the polysemous patterns observable in only one language always involve a particular set of notions characterized by a particular polysemous behavior (i.e. the federative notions) reveals that the linguistic diversity is related to the invariance since the federative notions are all involved in universal networks. Besides, the federative notions seem to make up the semantic hardcore of the universal networks.

Furthermore, it seems possible to correlate the semantic regularities reflecting the organization of polysemous qualities with Lazard's (1992:427-434) grammaticalization cognitive model. If we conceive of the set of possible grammaticalized notions as located in a multidimensional space, we can observe that: 1) some areas of this conceptual space are such that most of the languages construct grammatical tools in these particular areas […]; and 2) some parts of the areas which act as "fields of grammaticalization" have preferential status. So, as Lazard did, we observed two levels of invariants. Namely, at the first level, there are some universal invariants shared by almost all the languages—what we called universal polysemous networks. And at the second level, some of the notions, which participate in these universal networks, have a preferential status because they are more frequently involved in polysemous connections than others in the same semantic field— what we called federative notions.

[11] In fact, 18 % of the specific polysemies.

With regard to the semantic organization of grammaticalized notions or with regard to the semantic organization of polysemous qualitative notions, the underlying framework is always the same; it consists of two levels of invariance on which the linguistic variability hinges. But all in all, Lazard's idea about the organization of semantic spaces is really essential because his approach is based on a scale principle and not on a quantitative threshold level. First of all, it is difficult to define the quantitative limits which enable a statement about the universal character of a linguistic feature. The typical features of recurring semantic phenomena are fixed in accordance with a continuum; and what is observable for a highly recurring feature is also potentially valid for a low recurring feature. Second, the semantic features characteristic of one or a few languages seem to be related to the recurring ones since they are built on the basis of those recurring facts. In this sense, a typological method which consists of a contrastive study between what is highly recurring and what is unique neglects an important part of the corpus: all the features shared by few languages.

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Appendix 1. List of the 110 notions studied

ENGLISH	FRANCAIS	DEUTSCH
ACID	acide	sauer
BAD	mauvais	schlecht
BEAUTIFUL	beau	schön
BENT	courbé	krumm
BIG	gros	groß
BITTER	amer	bitter
BLUNT	émoussé	stumpf
BOILED	cuit	gekocht
BRAVE	courageux	mutig
CALM	calme	ruhig
CHEAP	bon-marché	billig
light	CLAIR.	hell
CLEAN	propre	sauber
CLEVER	malin	schlau
COLD	froid	kalt
CONSTANT	constant	beständig
COOL	frais	frisch
COWARDLY	lâche	feige
DEEP	profond	tief
DIFFICULT	difficile	schwierig
DELICIOUS	délicieux	schmackhaft
DENSE	dense	dicht
thick	épais	DICK
thick	épais (non-liquide)	DICKFLÜSSIG
DIRTY	sale	schmutzig
soft	DOUX	sanft
DRESSED	habillé	angezogen
right	DROITE	rechts
DRY	sec	trocken
EASY	facile	einfach
EMPTY	vide	leer
EXPENSIVE	cher	teuer
FAR	loin	fern
FAST	rapide	schnell
FAT	gras	fett
FEARFUL	peureux	ängstlich
FLAT	plat	flach
FRAGILE	fragile	zerbrechlich
FREQUENT	fréquent	häufig
FULL	plein	voll
GAY	joyeux	fröhlich
GENEROUS	généreux	freigiebig

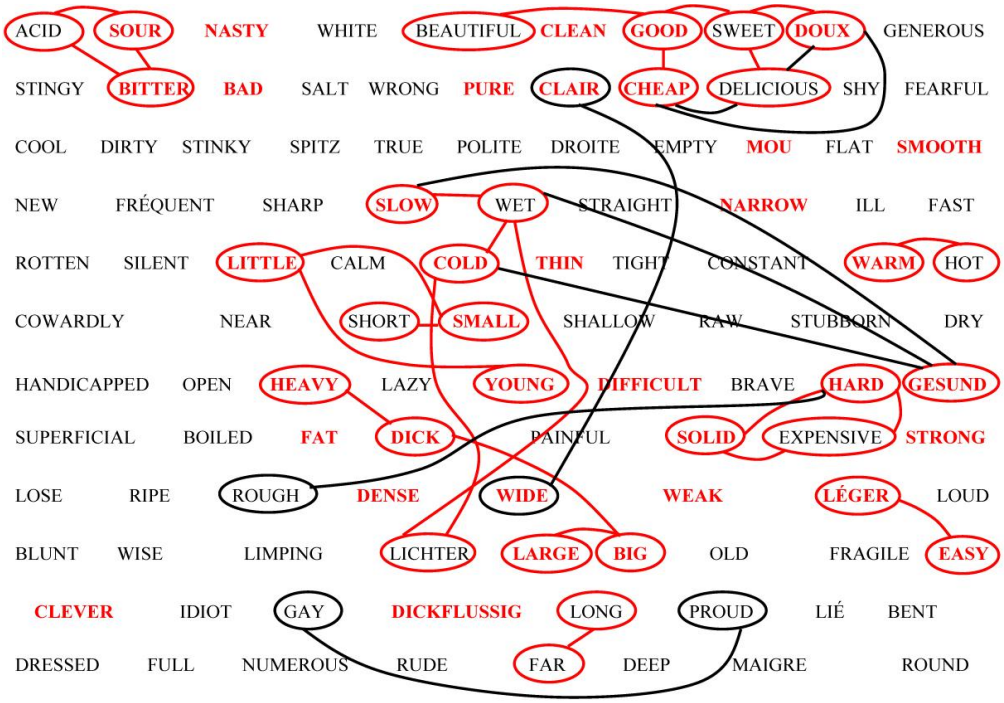
ENGLISH	FRANCAIS	DEUTSCH
LIMPING	boiteux	hinkend
LITTLE	petit, jeune	klein
LONG	long	lang
untied	détaché	LOSE
LOUD	bruyant	laut
thin	MAIGRE	mager
soft	MOU	weich
NASTY	méchant	boshaft
NARROW	étroit	eng
NEAR	proche	nah
NEW	nouveau	neu
NUMEROUS	nombreux	zahlreich
OLD	vieux	alt
OPEN	ouvert	offen
PAINFUL	douloureux	schmerzhaft
POOR	pauvre	arm
POLITE	poli	höflich
PROUD	fier	stolz
PURE	pur	rein
RAW	cru	roh
RIPE	mûr	reif
ROTTEN	pourri	verdorben
ROUGH	rugueux	rauh
ROUND	rond	rund
RUDE	impoli	unhöflich
SHALLOW	peu profond	seicht
SALT	salé	salzig
SHARP	tranchant	scharf
SHORT	court	kurz
SHY	timide	schüchtern
SILENT	silencieux	still
SLOW	lent	langsam
SMALL	petit (de taille)	klein
SMOOTH	lisse	glatt
SOLID	solide	fest
SOUR	aigre	sauer
pointed	pointu	SPITZ
STINGY	avare	geizig
STINKY	malodorant	stinkend
STRAIGHT	droit	gerade
STRONG	fort	stark
STUBBORN	têtu	stur

healthy	en bonne santé	GESUND		SUPERFICIAL	superficiel	oberflächlich
GOOD	bon	gut		SWEET	sucré	süß
HANDICAPPED	infirme	behindert		TIGHT	serré	eng
HARD	dur	hart		THIN	mince	dünn
HEAVY	lourd	schwer		TRUE	vrai	wahr
HOT	chaud (brûlant)	heiß		WARM	chaud	warm
foolish	IDIOT	dumm		WEAK	faible	schwach
ILL	malade	krank		WET	humide	feucht
LARGE	grand, vaste	groß		WHITE	blanc	weiß
LAZY	paresseux	faul		WIDE	large	weit
light	LÉGER	leicht		WISE	sage	weise
not dense	espacé	LICHT(ER).		WRONG	faux	falsch
tied up	LIÉ	festgebunden		YOUNG	jeune	jung

Appendix 2. List of the polysemous patterns observed in 24 languages

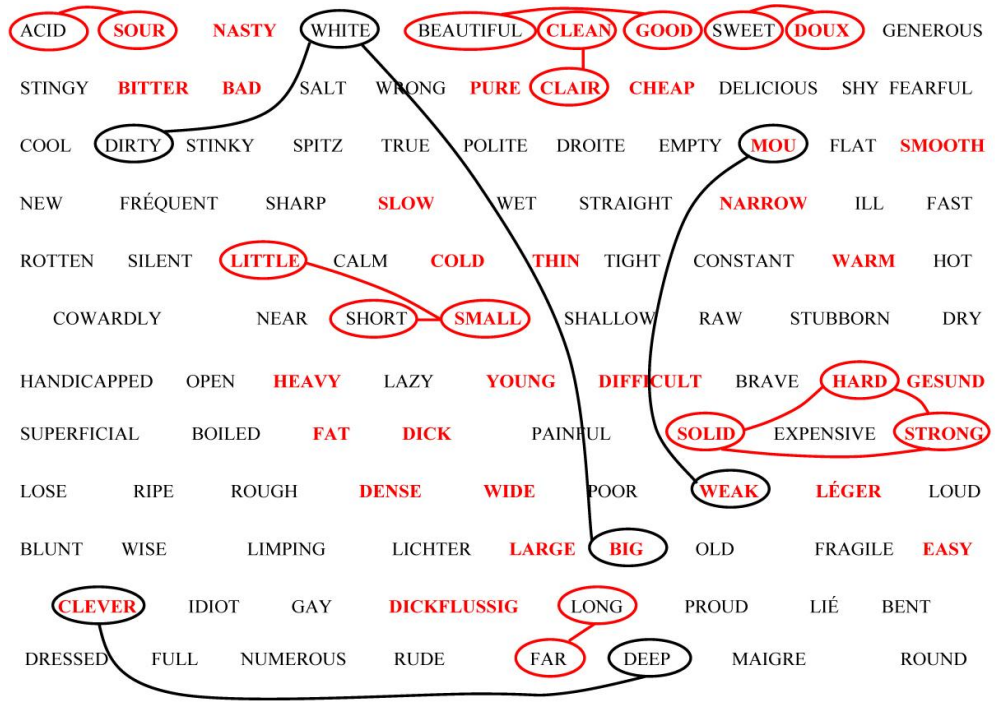
No. of languages concerned	Polysemous patterns observed in the corpus	No. of patterns
1	acid/salt; sour/blunt; sour/salt, bitter/solid, bitter/calm, bitter/salt, stingy/nasty, beautiful/clean, beautiful/true, white/dirty, white/poor, white/clair, cheap/mou, cheap/delicious, cheap/easy, cheap/doux, calm/solid, calm/shy, warm/ill, warm/wet, hot/fast, expensive/strong, expensive/warm, expensive/painful, clair/wide, clair/empty, constant/dense, constant/dick, brave/solid, brave/hard, bent/round, short/shallow, dense/frequent, straight/narrow, lose/superficial, doux/cold, doux/easy, hard/ripe, hard/sharp, hard/dick, gesund/clever, gesund/young, expensive/gesund, gesund/cold, gesund/slow, gesund/solid, gesund/wet, dick/lichter, dick/frequent, dickflüssig/little, dickflüssig/wide, dickflüssig/pure, lichter/open, narrow/young, narrow/little, narrow/léger, easy/cold, easy/shallow, easy/léger, easy/sweet, weak/handicapped, wrong/rude, proud/gay, proud/large, proud/big, strong/old, strong/big, fragile/mou, cold/lazy, cold/shy, cold/silent, fat/wide, young/thin, slow/silent, slow/wise, dressed/lié, smooth/clean, smooth/empty, heavy/wise, clever/dry, clever/deep, thin/little, mou/fearful, open/empty, lazy/fearful, shallow/near, rotten/dirty, pure/empty, pure/polite, pure/good, stubborn/solid, limping/handicapped, clair/easy, difficult/rude, straight/short, maigre/dry, narrow/idiot, weak/ill, weak/idiot, dirty/fat, fat/rude, slow/idiot, far/lichter, dickflüssig/heavy, hot/difficult, dickflüssig/big, far/deep, poor/stingy, poor/cheap, cheap/nasty, cheap/stingy, clair/léger, raw/cold, dense/idiot, doux/léger, straight/pure, narrow/long, narrow/weak, weak/fragile, weak/bad, wrong/bad, large/numerous, heavy/big, shallow/superficial, droite/good, good/true, doux/generous, delicious/doux, sour/bad, sweet/beautiful, mou/slow, true/polite, round/near, straight/good, wide/ numerous, poor/bad, small/weak, rude/rotten, heavy/solid, thin/small, smooth/calm, smooth/delicious, rough/difficult, rough/bad, white/big, deep/dick, léger/thin, cool/good	148 (57,8%)
2	good/clean, good/doux, warm/fast, expensive/solid, expensive/hard, brave/strong, boiled/clever, boiled/cold, boiled/ripe, hard/gesund, dick/wide, dick/large, weak/mou, big/wide, wet/slow, long/deep, expensive/difficult, constant/frequent, cowardly/lose, narrow/small, big/round, acid/nasty, sour/nasty, warm/difficult, raw/rude, raw/new, slow/idiot, heavy/difficult, thin/maigre, hard/rough, hard/rude, dickflüssig/solid, spitz/strong, strong/sharp, cool/wet, straight/droite, thin/weak, dickflüssig/fat	38 (14,8%)
3	bitter/stingy, raw/wet, big/old, full/numerous, clean/empty, white/clean, hard/stubborn, wet/cold, dick/fat, bitter/nasty, cheap/good, dense/dickflüssig, dense/dick, lichter/wide, lichter/large, narrow/tight, cold/calm, fat/big, weak/léger, fat/heavy, stinky/bad, bad/nasty, strong/loud, good/sweet, hard/difficult, bad/dirty, lose/open, solid/dick, short/near	29 (11,3%)
4	sour/bitter, cold/slow, narrow/thin, fragile/léger, slow/heavy, doux/smooth, weak/poor, clean/pure, smooth/flat, easy/léger, pure/true, weak/maigre, acid/bitter, dick/dickflüssig, dick/heavy, difficult/painful, stinky/rotten, hard/dry	18 (7%)
5	clair/clean, hot/warm, good/generous, good/delicious, dick/big, gesund/strong, sharp/spitz	7 (2,7%)
6	far/long, doux/sweet	2 (0,8%)
7	delicious/sweet, young/small, clever/wise,	3 (1,2%)
8	doux/mou, short/small	2 (0,8%)
9	strong/solid, large/wide	2 (0,8%)
10	hard/solid, hard/strong	2 (0,8%)
11	large/big	1 (0,4)
12	young/little	1 (0,4)
13	beautiful/good, small/little	2 (0,8%)
16	acid/sour	1 (0,4%)
	Total	**256**

Appendix 3. Additional semantic maps



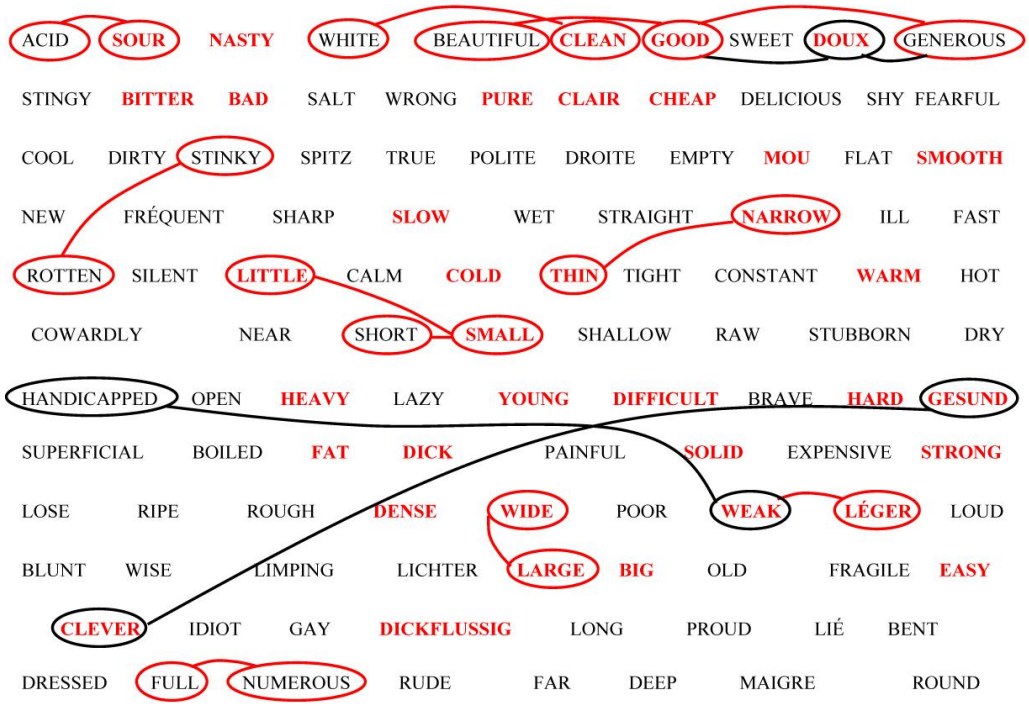
24 recurring polysemies *versus* 9 specific polysemies

Figure a: Cerma semantic map



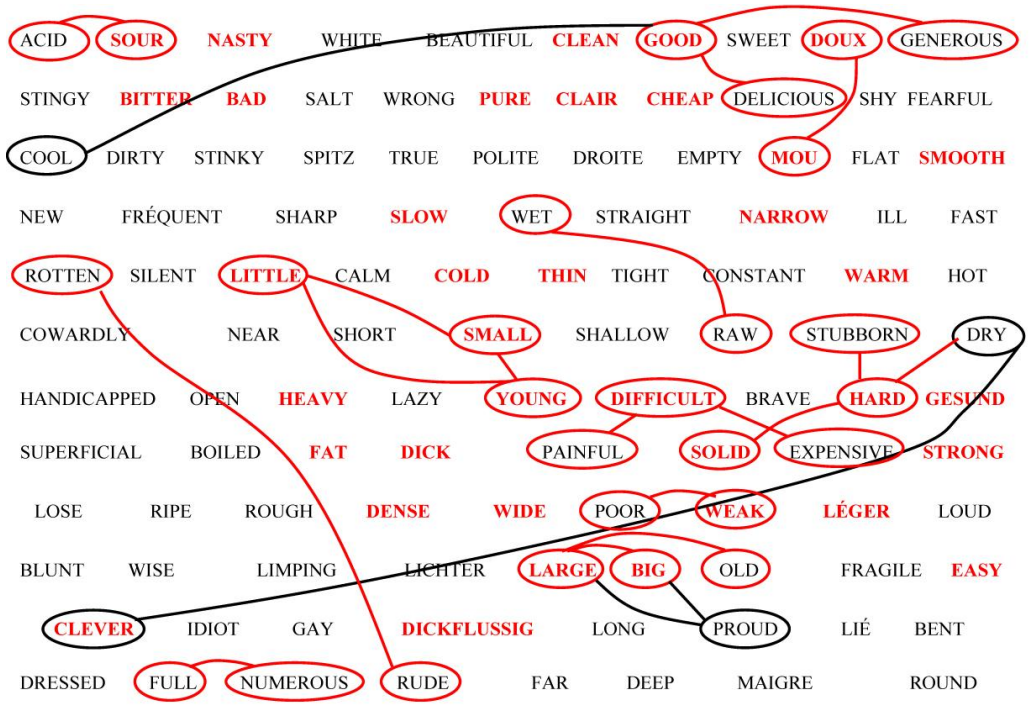
10 recurring polysemies *versus* 4 specific polysemies

Figure b: Gbaya semantic map



12 recurring polysemies *versus* 3 specific polysemies

Figure c: Jola semantic map



18 recurring polysemies *versus* 4 specific polysemies

Figure d: Wolof semantic map