

## The Fickle Polysemy of Emotions

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### Abstract

The study presented here accounts for the description of regular polysemy links by means of formal analytic definitions of French lexical units. The fine grained level of decomposition of these lexicographic definitions allows us to extract fine grained polysemy patterns and thus to express subtle regularities. Our methodology is illustrated on data selected among the semantic field of emotions.

### Keywords

Regular polysemy, polysemy patterns, formal lexicographic definitions.

## 1 Introduction

This paper deals with the representation of French regular polysemy in a semantic lexicon intended for NLP applications. We follow Juri Apresjan's definition of regular polysemy and consider that a semantic link between two lexical units that share the same form is regular if it applies to at least two pairs of lexical units (Apresjan, 1974). For instance, lexical units denoting a certain kind of emotion are regularly linked to lexical units denoting the object of an emotion, as illustrated below.

- (1) **AMOUR#1 (love)** [*Sa naïveté l'empêche de comprendre qu'elle ressent de l'amour pour son cousin. / She is too naïve to realize that she is in love with her cousin.*] ~ **AMOUR#2** [*Mon amour a les cheveux noirs. / Black is the color of my true love's hair.*]
- (2) **ESPOIR#1 (hope)** [*Internet suscite un immense espoir chez les jeunes scolarisés. / Internet raises schooling young people's hopes.*] ~ **ESPOIR#2** [*Vous êtes mon dernier espoir. / you are my last hope.*]

How should we model this semantic link to account for its effective regularity? The pair of semantic labels given above (emotion ~ object of an emotion) is not sufficient for at least two reasons. First, a pair of semantic labels generally doesn't give us information about the nature of the semantic link. For example, we don't know if this polysemy link is metonymic or metaphoric. Secondly, this kind of modelization is too general to determine the right set of lexies that applies to the link. Indeed, every lexical unit that denotes an emotion

can't generate another lexical unit that denotes the object of (this) emotion. These two points (lack of meta-information on semantic links and risk of overgeneration) argue for a more precise characterization of regular polysemy links (Copestake & Briscoe, 1995). In order to provide such a characterization, we will resort to the lexicographic definitions of the BDéf, a formal database derived from the Explanatory Combinatorial Dictionary of Contemporary French (Altman & Polguère, 2003). These formal definitions are split into elementary elements and explicitly structured, which allows us for a richer description of polysemy links.

The paper is made up of three further sections. Section 2 explains how we extract polysemy patterns from the semantic descriptions of the BDéf. Section 3 shows how this methodology is generalized within a given semantic field, illustrated here with the semantic field of emotions. Finally, section 4 draws up a description of the polysemy patterns from the polysemy domain of emotions presented in the previous section.

## 2 Modeling polysemy link from semantic decompositions

### 2.1 Description of a polysemy link

In *Explanatory Combinatorial Lexicology* (Mel'čuk *et al.*, 1995), a polysemic vocable is the reunion of lexical units that share the same forms and that share a non-trivial semantic component (*i.e.* that are not homonyms). We define a polysemy link as an oriented semantic link between two lexical units of a polysemic vocable. Since the link is oriented, we distinguish the **source** lexical unit from the (semantically) **derived** lexical unit. Considering the examples given in the introduction, AMOUR#1 and ESPOIR#1 are source lexical units and AMOUR#2 and ESPOIR#2 are semantically derived from their source lexical unit.

A **polysemy pattern**, descriptive tool used to model polysemy links in the BDéf, will be made up of two kinds of information:

1. **The underspecification of the pair of lexical units that can apply to it.** As mentioned in the introduction, the semantic characterization of the two lexical units can be more or less underspecified. One can only refer to the semantic type of the two lexical units (as seen above with the link `emotion` → `object of an emotion`) or specify more when it is possible. For example, in this case, the first obvious specification is to say that the lexical unit that denotes an emotion must have a second actant representing the object of the emotion.

2. **The explanation of the semantic link between the source lexical unit and the derived lexical unit.** This explanation, which justifies the two units not being homonyms, must be supported by the semantic underspecification. Indeed, if we consider that a lexical unit L1 is **metaphorically linked** to another lexical unit L2, we have to explicit the **analogy** between the underspecification of L1 and that of L2. If we consider on the contrary that a lexical unit L1 is **metonymically** linked to another lexical unit L2, we have to explicit the **contiguity** between the underspecification of L1 and that of L2. The link `emotion` → `object of an emotion` is a

metonymy link since the derived lexical unit corresponds to the source unit's second actant.

## 2.2 The formal definitions of the BDéf database

We cannot present here in detail the BDéf definitions formalism (see for a more precise presentation (Altman and Polguère, 2003) and (Barque and Nasr, 2005)). Let's say briefly that the BDéf definitions are split into **elementary propositions**, each of them identified by a number. These elementary propositions are put together into **defining blocks**: the first one represents the central component of the definition and the following ones represent the peripheral components, corresponding to Aristotle's *genus-differentiae* distinction. The BDéf entries of ROUGIR#1 and ROUGIR#2 are presented below in Figure 1. We illustrate first these two acceptations of the vocable ROUGIR by giving an example:

- (3) **ROUGIR#1 (to blush)** [*La crainte de rougir affecte davantage les femmes que les hommes. / The fear of blushing more greatly affects women than men.*] → **ROUGIR#2 (to be ashamed of)** [*Il n'y a pas à rougir de servir un vin dont le prix est modeste. / There is no need to be ashamed of serving a modestly-priced wine.*]

ROUGIR#1 ( <i>to blush</i> )	ROUGIR#2 ( <i>to be ashamed of</i> )
<p><b>Propositional form</b> : X ~ manifesting Y provoqued by Z</p> <p><b>Semantic label</b> : physical reaction</p> <p><b>Central component</b> :</p> <p style="padding-left: 40px;">/*Physical reaction*/ 1 : X physically reacts to Z</p> <p><b>Peripheral components</b> :</p> <p style="padding-left: 40px;">/*Nature*/ 2 : *1 consists in *3 3 : X's face got red</p> <p style="padding-left: 40px;">/*Trigger[optional]*/ 4 : *1 is provoqued by *5 5 : Z arouse Y of X</p> <p><b>Actants typing</b> :</p> <p>X : person Y : emotion Z : fact</p>	<p><b>Propositional form</b> : X ~ de Z</p> <p><b>Semantic label</b> : bad feeling</p> <p><b>Central component</b> :</p> <p style="padding-left: 40px;">/*Bad feeling*/ 1 : X feels ashamed of Z</p> <p><b>Peripheral components</b> :</p> <p><b>Actants typing</b> :</p> <p>X : person Z : fact</p>

Figure 1 : BDéf definitions of the French verbs ROUGIR#1 and ROUGIR#2

The definition of ROUGIR#1 in Figure 1 is made of five elementary propositions grouped into three defining blocks, labelled /\*Physical reaction\*/ for the central component, /\*Nature\*/ and /\*Trigger\*/ for the peripheral components. The block /\*Trigger\*/ is optional since the physical reaction is not always related to an emotion (for example, there is no emotion involved when the physical reaction is caused by an effort). The lexical unit controls three actants: X is the person who physically reacts, Y is the emotion (Il rougit *de colère* / He reddened *with anger*.)<sup>1</sup> and Z denotes what causes the emotion (*à ces mots, elle rougit* / She reddened *at these words*). The verb ROUGIR#2 is defined by only one proposition, that is, by a synonym (ROUGIR#2 ≈ to be ashamed of)<sup>2</sup>. The verb has two actants: X is the experiencer of the feeling and Z represents what causes X's feeling.

These two definitions, given here to illustrate the BDéf formalism, will be used in the next section to present our methodology of construction of polysemy patterns.

### 2.3 A sample of polysemy pattern

The methodology we adopt to model regular polysemy links consists of extracting information from two pairs of lexicographic definitions that share the same polysemy link. As an illustration, we will consider the pair of lexical units from the vocable ROUGIR presented above (Figure 1) and the pair of lexical units from the vocable TREMBLER presented below in Figure 2. We first presented an example of the two acceptations of the vocable TREMBLER.

- (4) **TREMBLER#1 (to shake)** [*Certains joueurs ont la main qui tremble lorsqu'ils misent en ayant une très forte main. / Some players' hands shake when they are placing a bet if they have a very strong hand.*] ~ **TREMBLER#2 (to cower before sb)** [*Le plus intéressant serait de comprendre pourquoi nos bureaucrates et dirigeants tremblent devant les tyrans. / It might be more useful to learn what inside our bureaucrats and our leaders makes them cower before tyrants.*]

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<sup>1</sup> Note that since the actant Y appears only in an optional defining block, it is, as a result, optional too.

<sup>2</sup> This kind of semantic representation for the verb ROUGIR#2 is sufficient here to characterize the link between ROUGIR#1 and ROUGIR#2 since the common component that makes the metonymy is obvious in the meaning of 'feeling ashamed': emotion in the source lexical unit and feeling in the derived lexical unit. However that may be, figurative units are not "new" senses, they are another way to express a meaning that already exists. The polysemy link has to be made explicit in the description to have a more complete view on the meaning of figurative units.



SOURCE LEXICAL UNIT	DERIVED LEXICAL UNIT
<p><b>Propositional form :</b></p> <p><b>Semantic label :</b>physical reaction</p> <p><b>Central component :</b></p> <pre> /*Physical reaction*/ 1 : X physically reacts to Z </pre> <p><b>Peripheral components :</b></p> <pre> /*Nature*/ 2 : *1 consists in *3 3 : </pre> <pre> /*Trigger[optional]*/ 4 : *1 is provoqued by *5 5: Z arouse Y of X </pre> <p><b>Actants typing :</b></p> <p>X : person Y : emotion Z : fact</p>	<p><b>Propositional form :</b></p> <p><b>Semantic label :</b>bad feeling</p> <p><b>Central component :</b></p> <pre> /*Bad feeling*/ 1 : </pre> <p><b>Peripheral components :</b></p> <p><b>Actants typing :</b></p> <p>X : person Z : fact or person</p>
<p><b>Weak metonymy<sup>3</sup> :</b></p> <p><b>Metonymy:</b> the derived lexical unit denotes a feeling by one of its most prototypical manifestation, which is, going red with shame and trembling with fear.</p> <p><b>Weak metonymy:</b> the feeling denoted by the derived lexical units is not joined generally by the physical reaction. Moreover, the physical reaction is linked to an <b>emotion</b> whereas the derived lexical unit denotes a <b>feeling</b><sup>4</sup>.</p>	

Figure 3 : The metonymy pattern physical reaction → bad feeling

The polysemy pattern presented in Figure 3 contains on the one hand the semantic intersection shared by the two pairs of definitions of ROUGIR#1~ROUGIR#2 and TREMBLER#1~TREMBLER#2 and on the other hand the explanation of the type of polysemy link, metonymy to be specific.

Once we have extracted the pattern from the two pairs of definitions, we have to determine the regularity of the semantic link in the concerned polysemy domain. We find at least another pair of lexical units that can apply to it, just as it is: the verb PLEURER denotes a physical

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<sup>3</sup> Weak metonymy is characterized by the fact that the derived lexical unit doesn't include the meaning of the source lexical unit, which is the classical condition for (strong) metonymy (Barque & Polguère, 2005). For example, the metonymy link between HOPE#1 (emotion) and HOPE#2 (object of the emotion) is strong since the definition of HOPE#2 includes HOPE#1. On the contrary, the link between ROUGIR#1 (physical reaction) and ROUGIR#2 (bad feeling) is weak since the definition of ROUGIR#2 doesn't include ROUGIR#1.

<sup>4</sup> In our framework, an emotion is defined as a subtype of feeling, a feeling that is sudden, intense, etc.

reaction and a feeling that can involve this physical reaction. We also note that many French locutions should be related to this pattern (like DONNER LA CHAIR DE POULE (*to give someone gooseflesh*), AVOIR LES CHOCOTTES (*to have the heebie-jeebies*), FAIRE DANS SON FROC (*to be wetting o.s.*...), with the treatment appropriate to this kind of lexical unit.

### 3 The polysemy domain of emotions

The polysemy pattern presented in the previous section (Figure 3) concerns lexical units that include the sense ‘feeling’ or ‘emotion’. Note that our goal is not to describe the entire polysemy domain of emotions<sup>5</sup> but rather to give a first characterization of the sense extensions that are likely to apply to this kind of lexical unit. Therefore, we propose the notion of **polysemy domain** that helps us to delimit and organize the set of lexical units for studying regular polysemy in a given semantic class.

A polysemy domain can be considered as an expansion of the notion of semantic field, as it is defined by the *Explanatory Combinatorial Lexicology*. Indeed, a polysemy domain is partly composed of lexical units that don’t include in their definition the semantic components shared by every lexical unit of the semantic field as long as the former are linked by polysemy to at least one of the latter. For example, the polysemy domain of emotions brings together the lexical units from the semantic field of emotions and lexical units that don’t include the semantic component ‘emotion’ but that are “polysemically linked” to lexical units from the semantic field, as illustrated in the two following examples:

(5) **AMER#1** [*Elle avait pris à boire un truc amer et lui un whisky. / She had a bitter drink and he had a whisky.*] **is semantically linked to AMER#2** [*La mélancolie lui venait aussi de son expérience amère durant la guerre. / A bitter experience during the war has made him melancholic.*] **because** there is an **analogy** between the effect of the flavour denoted by AMER#1 and the effect of the fact that causes the feeling denoted by AMER#2.

(6) **JALOUSIE#3** [*Il a également nié avoir été fou de jalousie et de rage après avoir découvert la liaison d’Angelika avec un homme marié. / He also denied he was consumed by jealousy and rage after he found out that Angelika was having an affair with a married man.*] **is semantically linked to JALOUSIE#2** [*On peut installer des jalousies aux fenêtres si nécessaire. / A slatted blind can be drawn across the window when required.*] **because** one can imagine a situation where a jealous person spies on his beloved since suspicious behaviour is prototypically associated with this feeling.

The two pairs of lexical units given in (5) and (6) show two kinds of orientations: from a lexical unit that doesn’t include the domain component to a lexical unit that includes it for (5) and the opposite for (6). The fine grained level of decomposition of the BDéf definitions allows for the definition of a wider set of polysemy links. Indeed, we can distinguish more

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<sup>5</sup> The semantic class of emotions is of course too complex for us to claim to cover its polysemy. The only delimitation of the class, which has been widely discussed in the literature, raises many problems (see among others (Anscombe, 1995), (Bouillon, 1998), (Tutin *et al.*, 2006)).

than the two types of polysemy mentioned above, according to the position of the domain component in the lexicographic definition. We focus here on three different positions:

1. The domain component corresponds to the central component in the definition of the lexical unit, like the two lexical units presented below:
  - i. X REGRETTER#2 Y (*to regret*) ≡ ‘X **feels sorry** because he wish that Y had not happened.’
  - ii. X est TRISTE#1 à cause de Y (*sad*) ≡ ‘X **feels bad** because Y has happened and X doesn’t like Y.’
2. The domain component corresponds to one of the peripheral components in the definition of the lexical unit, like the two lexical units presented below.
  - i. SIMULATEUR#1 ≡ ‘A person that pretends to feel (among others) an **emotion**.’
  - ii. COEUR#2 (*heart*) ≡ ‘An imaginary organ where the deepest and strongest **feelings and emotions** are.’
3. The domain component corresponds to the type of one of the actants of the lexical unit.
  - i. X ÉPERDU#2 ≡ ‘[X:**feeling**] which is very strong.’ [*Un amour éperdu / violent love*]
  - ii. X IVRE#2 de Y ≡ ‘X strongly feels [Y:**feeling**].’ [*ivre de joie / wild with joy*]

These last examples can be regarded as collocatives of emotions since they (only) denote the intensity of the emotion (Mel’čuk *et al.*, 1995; Tutin *et al.*, 2006).

## 4 Polysemy patterns from the polysemy domain of emotions

The aim of this section is to give a brief survey of the regular sense extensions of the polysemy domain of emotions. Due to lack of space, we cannot present the complete polysemy patterns associated with the (non-exhaustive) list of sense extensions mentioned below: for each of them we will only give the semantic labels of the source and derived lexical units and the vocables of the polysemy domain of emotion that apply to the link. Our study (in progress) of the polysemy domain shows that the patterns concerns quite few lexical units, in other words that polysemy is quite fickle concerning this semantic field.

### 4.1 Metonymies

As previously mentioned, we consider as metonymically linked two lexical units whose denotations present a certain kind of contiguity.

emotion → object of an emotion : **Applies to** FIERTÉ (*pride*), HONTE (*shame ~ disgrace*), AMOUR (*love*), JOIE (*joy*), ESPOIR (*hope*)

feeling → linguistic communication : **Applies to** REGRETTER (*to regret ~ to deplore*), SOUHAITER (*to hope ~ to wish*)



(to cause) feeling → (to cause) romantic or sexual feeling:  
**Applies to** JALOUSIE (*envy ~ jealousy*), JOUIR (*to enjoy sth ~ to come*),  
TROUBLANT (*disturbing*)

physical reaction → bad feeling : **Applies to** ROUGIR (*to flush ~ to be  
ashamed of*), TREMBLER (*to shake ~ to fear for*), PLEURER (*to cry ~ to mourn for  
sb*)

## 4.2 Metaphors

We consider as metaphorically linked two lexical units whose denotations present a certain kind of analogy.

Bad physical sensation → bad feeling : **Applies to** DOULEUR (*pain ~  
sorrow*), IRRITATION (*irritation*), MALAISE (*faintness ~ uneasiness*), ULCÉRÉ  
(*ulcerated ~ appalled*)

flavour → feeling : **Applies to** SUCRÉ (*sweet ~ sugary*), ACIDE (*acid*),  
BITTER (*bitter*), AIGRE (*sour ~ cutting*), ÂCRE (*acid*)

to move sth → to cause a feeling : **Applies to** REMUER (*to move ~ to  
upset*), SECOUER (*to shake*), BOULEVERSER (*to turn upside down ~ to move  
deeply*)

## 5 Conclusion

The polysemy patterns presented in this study are still in construction. In a practical point of view, they are useful for the database development since they help to systematize the description by providing, if the need arise, underspecified entries. In addition, the hierarchical organization of these patterns (relying on the different levels of underspecification) may be interesting to study their cross linguistic validity and contribute to the delimitation between general extensions and idiosyncrasies.

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