On the Lexicalization of the Corners of the Square and the Hexagon

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Abstract

In his article 'Logic and Colour' (2012), Dany Jaspers argues that the asymmetry between the corners of the square may be "deeply rooted in the physiological structure of human cognition" by showing a parallelism between the quantified square and the realm of colours, where the **O**-corner (expressed by Cyan) is more complex than the other ones. However, this opinion can be criticized since, as I will show in this paper, the asymmetry is absent in some languages like Arabic, where the quantified and temporal **E**-corners are as complex as their correspondent **O**-corners. The asymmetry seems then to be more conventional than natural, since it is related to the functioning of the various languages, which is not the same.

1 Introduction

In his famous paper entitled 'Logic and Colour', Dany Jaspers (Jaspers, 2012) claims that the asymmetry between the four corners of the square and the complex nature of the **O**-corner that distinguishes it from the three other ones, has its counterpart in the realm of colours, since the colour occupying the **O**-corner (Cyan) is complex unlike those that occupy the three other corners. According to him, this makes the asymmetry natural, since it is deeply rooted in the psychological features of human perception. In this paper I wish to show that the naturalness of this asymmetry is not obvious and that the asymmetry is much more conventional and related to the rules of the different languages than it is to the features of the human mind, for it is not present in some languages like Arabic, which shows a symmetry between the affirmative and the negative corners. In the same vein, the two extra corners of the hexagon are expressed in complex ways, given their intrinsic complex nature which makes it difficult to

use a single word to express them. So the naturalness of the asymmetry is at least doubtful as I will try to show in this paper.

2 The asymmetry of the corners of the square and the hexagon

Many people[1] have noted that the square of oppositions, which contains four vertices, shows an asymmetry between these vertices, since three of them are expressed in natural languages by single linguistic items while the fourth one (the **O**-corner) is almost always expressed by two linguistic items. For instance, the four vertices of the quantified square are expressed thus in ordinary languages such as English and French respectively:

(**A**)	Every	(**E**)	None	(**I**)	Some	(**O**)	*Not every*
(**A**)	Tous	(**E**)	Aucun (or Nul)	(**I**)	Quelques	(**O**)	*Quelques ...ne pas*

In other squares, such as the modal square or the temporal one, the same phenomenon appears in both languages, for the modal **O** is expressed by 'non nécessaire' in French and by 'not necessary' in English, while the temporal **O** is expressed by 'pas toujours' in French and by 'not always' in English, unlike all other vertices which are expressed by single words.

In Jaspers' paper cited above, the colours are said to have the same relationships as that of the words expressing the vertices of the squares. They are classified by him in the following way: "the percept RED is taken to occupy the **A**-vertex held by EVERY in predicate logic, that BLUE is located in the **E**-corner whose occupant in predicate logic is NO, and that YELLOW is the counterpart of **I**-corner SOME" (Jaspers, 2012, 232). As to the **O**-vertex, it is occupied according to him by the colour called CYAN (Jaspers, 2012, 234). This gives the following vertices:

(**A**) Red (**E**) Blue (**I**) Yellow (**O**) *Cyan*

According to Jaspers, these four vertices show the same asymmetry that we find in the usual squares because the colour named Cyan is not natural as are the three other colours since it is "non-basic (non-naturally learned)" (Jaspers, 2012,

[1]For instance, Blanché (1969), Horn (1989) and Béziau (2003) among others.

234) or it is expressed by two linguistic items, such as the "Dutch *appelblauwzeegroen* ('*appleblue-seagreen*') or complex expressions such as *bluish green* or *greenish blue*" (Jaspers, 2012, 234). This shows a parallelism between the realm of colours and the realm of quantifiers in ordinary languages, since the **O**-corner is expressed by complex groups of words, while the three other corners, whether in the realm of colours or in other cases (alethic, temporal and deontic modalities, for instance), seem to be expressed quite naturally by single linguistic items known and used naturally by all speakers. D. Jaspers deduces from this parallelism the following idea: "What this suggests is that both in the logic of quantifiers and of colours the elements in this corner are for a reason to be unearthed conceptually *dyadic/binary rather than unary*. Due to this, they are comparatively harder to individualize or focalize conceptually, which I posit *is the reason why they do not lexicalize naturally or with ease*" (Jaspers, 2012, 234). So according to him, it is because this **O**-corner always involves two concepts rather than only one, it is hard to express by a single item or in a natural and easy way. This makes it artificial and distinguishes it from the three other corners which are much more natural and more easily expressible in many languages.

However, although there is no doubt that the **O**-corner in all these cases including the colour case is complex and involves two concepts, we should also notice that the same could be said about the **E**-corner, which also involves at least two concepts in almost all cases. For the **E**-corner is also *negative*, which means that it expresses also two ideas, not only one: the negation *plus* the *quantification* or the *alethic modality* or the *temporal modality* or the *deontic modality*, to take the most common cases. The question is thus the following: why should the **E**-corner be less complex that the **O** one, since in both cases, we have *two* concepts involved rather than only one? In what follows, I will try to answer this question by taking into account the expressions of both corners in Arabic and by showing that these corners are expressed in comparable ways in that language, which reduces the asymmetry by relativizing the singular character of **O**.

As to the hexagon, it contains two more vertices (**Y** and **U**), which both are complex in the quantified as well as the other cases. In the quantified case, these two vertices are the following:

(**Y**) 'Some but not all' and its contradictory
(**U**) 'Either all or none'

The items corresponding to these vertices in the modal, temporal and deontic cases are also complex for in the modal case, we find the following expressions:

(**Y**) 'Possible but not necessary' and its contradictory
(**U**) 'Either impossible or necessary'

In the temporal case, we have the following vertices:

(**Y**) 'Sometimes but not always' and its contradictory
(**U**) 'Either never or always'

And in the deontic case, the two additional vertices are the following:

(**Y**) 'Permitted but not obligatory' and its contradictory
(**U**) 'Either forbidden or obligatory'

All these additional vertices are without any doubt complex and not easy to express by a single item, given the multiplicity of the concepts involved. It is thus quite natural to find in each of these cases several words to express the whole set of ideas involved. The same complexity with regard to these vertices can be found in other languages such as French, Arabic and others. In the realm of colours, D. Jaspers says that the **Y**-corner is represented by the colour Green, while the **U**-corner is represented by the colour Magenta (Jaspers, 2012, 241). Both are complex since green is a combination of Yellow and Cyan, while Magenta is something between Red and Blue as shown in the star presented at page 243. He adds that the lack of lexicalization concerns not only the **O**-corner but also the **U**-corner as well, which according to him is never expressed by a single word in any language, for he says: "to my knowledge no natural language has a natural lexicalization for 101 quantifiers: there is no **allno*, just as there is no **nall* (Fig. 10)" (Jaspers, 2012, 245).

However, why should we restrict ourselves to the **O** and **U**-corners, since there is no single word representing the **Y**-corner as well, which is at least as complex as the **U** one in whatever language we consider? So here too, it seems that the complexity or the naturalness of the expressions corresponding to the different vertices of the hexagon should be reconsidered in the light of what we can find in various languages.

3 The expressions of the E, O, U and Y-corners in Arabic

In Arabic, the corners of the quantified and temporal squares, for instance, are expressed in a comparable way as shown below, for the quantified corners are the following:

(**A**) *Kull* (**E**) *Lā aḥada* (**I**) *Ba'ḍ* (**O**) *Laysa Kull*

While the temporal corners are the following:

(**A**) *Dā'iman* (**E**) *Laysa al battata* (**I**) *Aḥyānan* (**O**) *Laysa Dā'iman*

As we can see, both **E** and **O** are complex, i.e. expressed by two linguistic items. As to the **Y** and **U**-corners, they are also complex, for they are expressed in the following ways in both cases. The quantified expressions are the following:

(**Y**) *Ba'ḍ wa* (or *Lākin* (= but)) *Laysa Kull*
(**U**) *Immā Kull aw Lā aḥada*

While the temporal expressions are the following:

(**Y**) *Aḥyānan wa (Lākin) Laysa Dā'iman*
(**U**) *Immā Dā'iman aw Laysa al battata* (or *Laysa Abadan*)

In the modal and the deontic squares, the **E**-corners can be expressed by single items, which are the following: Modal **E** *Mumtana'*; and Deontic **E** *Mamnū'*.

This is so because these two words come from the same root, which is *'mana'a'* (= to forbid), and express correlative ideas, which are respectively 'naturally prohibited' and 'legally prohibited'. So we could say that they are expressed by single items because the negation involved in their meanings is already present in the root from which they are both constructed.

However, the other **E**, **Y** and **U** items are not only constructions involving a negative root like the verb *mana'a*. Rather they contain the negative particle *lā* or *laysa* (= no) plus something else, *lā aḥada* meaning literally 'no one', *laysa al-battata* meaning literally 'no ever', *laysa kull* meaning literally 'not all' and *laysa dā'iman* meaning literally 'not always'. As to the **U** and **Y** vertices, they are even more complex since they contain in addition logical operators like the conjunction and the disjunction [expressed by *wa* or *lākin* (= 'and' or 'but') and *aw* (= 'or')] which are used to relate two elements, one of which is itself complex. This is why these corners cannot be expressed naturally by single items. The same can be said about the **E**-corners which involve as we saw two distinct ideas both in the quantified case and in the temporal one.

4 The E-, Y- and U-corners in English and French

So the question is: why is the **E**-corner expressed in English and French by a single item despite its intrinsically complex meaning, while it is not so naturally

expressed in Arabic? The answer could be related to the functioning of these various languages. The functioning of Arabic is very different from that of the Indo-European languages, for the process that Ferdinand de Saussure, for instance, calls 'agglutination', which produces single words by sticking together two initially distinct linguistic items, is very rarely used in Arabic, which uses other methods to construct the various words, while it is very much used in both English and French, among other languages. In a previous paper (Chatti, 2017) I have argued that agglutination is one of the reasons why the **E**-corners of the square are expressed by single items in both French and English. This process is the operation of sticking together two initially independent words so that they become a single word when they are regularly and repetitively used by speakers in their ordinary lives. Saussure gives the example of the word 'toujours', which is by the way the **A**-corner of the temporal square, and says that this word comes from two distinct items which are 'tous' (= every) and 'jours' (= days). People have stuck together these two words because they always used them together by saying 'tous jours'. Note that 'tous jours' is pronounced in exactly the same way as 'toujours'; this could also explain why it became a single word. This grouping was repeated regularly by all speakers, which was the reason why the word thus produced entered into the language. According to Saussure, agglutination is a spontaneous process, since he says "It occurs by itself [Elle se fait d'elle-même]" (de Saussure, 1967, 243); this is why the words created by this process appear to be naturally used by the speakers. He says: when there is "a simple element which was previously composed of two or more elements, then we are in front of an agglutination" (de Saussure, 1967, 245, my translation). This spontaneous character might be the reason why the items thus constructed are considered as natural or at least naturally expressed, since they are used by all the speakers of the language very regularly and easily.

Saussure's example can be generalized to the English (and French) items expressing the **E** vertices of the squares, in particular in the quantified and temporal cases. For it is easy to see that 'None', for instance, is a combination of 'no' and 'one', which the speakers may very well have used several times together so that they became one unique word, constructed by agglutination and simplified by ruling out one of the (o) vowels, probably for more fluency and simplicity. As to the word 'Never', it is also a combination of 'No' and 'Ever', and may have come from sticking these words together so as to construct the single item 'Never' by agglutination and simplification. Here too, one of the vowels had to be ruled out, probably for more simplicity.

Now as we noted above, agglutination is not very much used in Arabic, which

explains the fact that the **E**-corners in that language are still expressed by two separate linguistic items.

However, as D. Jaspers has rightly noted, no process of that kind has been used to construct a word like 'nall', for instance, which would have been a combination of 'not' and 'all' and would have expressed the **O**-corner. So why did the agglutination process not work for the word 'nall' which does not and has never existed in English?

I could try to explain this by noting that 'nall' would be the combination of 'not' and 'all'; it is not a combination of 'no' and 'all'. Nobody says 'No all' to express the **O**-corner. For this reason, agglutination is not so easily applicable to these two items, and if it were, it would produce another word, closer to the combination of 'not' and 'all', which would be something like 'notall'. While in the case of 'None' and 'Never', it is the word 'no' which is put in front of 'one' or 'ever', and it is much easier to get them by agglutination of 'no' and 'one' or 'no' and 'ever', since they are much more easily pronounced. Since agglutination is an oral process, that occurs in everyday life and is used by people in their usual and common interactions, it seems natural that a word like 'nall' could not be produced simply by agglutination because 'nall' would not be the result of sticking together two distinct items; it involves a more important change that could not be produced spontaneously by people in their everyday conversations.

On the other hand, in English there is a single word that expresses the **O**-corner in one of the squares listed above. This word is 'unnecessary' and it means the same as 'Not necessary', which is the **O**-corner of the modal square. This word is a single one, but it is not produced by agglutination. Rather it is produced by analogy with all words containing the same prefix 'un'. Analogy is another process evoked by Saussure and it can be used to explain the construction of many kinds of words in ordinary languages, and also of some **E** vertices, such as the word 'Impossible', which is the modal **E** in both English and French and is produced by adding the prefix 'im' to the word 'possible', by analogy with all words containing the same prefix. The existence of the word 'unnecessary' in English relativizes the singularity of the **O**-corner, for it shows that there are cases where **O** is expressed by a single item rather than two or more. In this case, the word exists in English, although it does not exist in French or Arabic. We might explain its presence in English and its absence in other languages by saying that in its ordinary usages, 'unnecessary' does not only mean 'not necessary', it means much more frequently 'not needed' and 'not expected'. This could explain why it is present and used in English but not in French, for instance, where the **O**-corner of the modal square remains complex.

Now what about the corners **U** and **Y**? Could they be expressed by single items? It seems very difficult to express these corners by single items, in my view. For agglutination could not be applied to 'all or no' (= **U**) just because of the presence and the meaning of the word 'or'. Agglutination combines two words when their meanings are added to each other, it does not apply to a combination where there is no such addition, but a kind of separation instead, expressed by the disjunction. As to the **Y**-corner, it is also more complex than both **E** and **O** for it combines between two distinct corners (**I** and **O**) and contains also a logical operator. It seems thus difficult to express all these ideas by a single linguistic item. As a matter of fact, in ordinary languages, the **Y** vertex seems to express what is meant by the particular in its ordinary usages as Blanché has stressed. But the ideas involved, i.e. ('some but not all') are much more implicit than explicit. For this reason, no single word can express solely all this amount of implicit ideas and the expression of this corner remains complex. The word 'Some' alone is not sufficient to render this complex meaning, which remains implicit and not explicitly said.

5 Conclusion

It seems then that the asymmetry found in the square and the hexagon of oppositions is much more conventional than natural as assumed by D. Jaspers. For as we have shown above, there is no asymmetry in some languages, where the **E**-corner is expressed in a complex way, exactly like the **O**-corner. On the other hand, in some cases, the **O**-corner itself is expressed by a single item, which shows that the asymmetry is not always present even in some Indo-European languages. This shows that the asymmetry depends on the processes that govern the construction of the various words, on the grammatical and pragmatic rules of these languages and on the behaviour of the speakers themselves, who accept or reject the new words constructed for reasons that are not always determined precisely and seem to depend only on their social and linguistic needs. For this reason, the asymmetry seems more conventional than natural or due to the human mind and its natural cognitive abilities.

References

Béziau, Jean-Yves. 2003. New light on the square of oppositions and its nameless corner. *Immunological Investigations* 10. 218–233.

Blanché, Robert. 1969. *Structures intellectuelles. essai sur l'organisation systématique des concepts*. Paris: Editions Vrin.

Chatti, Saloua. 2017. On the asymmetry between the four corners of the square. In Jean-Yves Beziau (ed.), *Workshop "the arbitrariness of the sign"* (Congress Le Cours de Linguistique générale, L'émergence, University of Geneva, January 2017). published online https://www.clg2016.org/documents/CLG2016–Chatti.pdf.

Horn, Laurence. 1989. *A natural history of negation*. Chicago: University of Chicago Press.

Jaspers, Dany. 2012. Logic and colour. *Logica Universalis* 6(1). 227–248.

de Saussure, Ferdinand. 1967. *Cours de linguistique générale (translation Tullio de Mauro)*. Paris: Editions Payot & Rivages.