DUAL as a core concept and the pronounceability of alternatives

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Abstract

Chemla (2007) observed that the French universal quantifier *tous* ('all') is anti-dual, even though French has no word for 'both' to feed a *Maximize Presupposition* competition.[1] This has become one of the better-known examples suggesting the need for 'conceptual alternatives' (Buccola, Križ, and Chemla 2018), but no detailed account of it has been put forth. Furthermore, we show that a naive implementation of the idea overgenerates anti-duality inferences in other quantifiers, such as *each*, *which* and *one* in English and French. This paper proposes an account of Chemla's (2007) puzzle where French *tous* has a dual universal alternative built from a dual core concept. That alternative is blocked from being realized due to a principle that we call *Avoid Ambiguity*. In addition to accounting for *tous*'s anti-duality, this proposal accounts for the lack of anti-duality in other quantifiers.

1 The puzzle

The English universal quantifiers *all* and *every* are 'anti-dual', i.e., cannot be used if their domain is known to contain only two individuals, as shown in (1-a). Instead, the dual universal quantifier *both* can be used in those contexts (1-b).

(1) a. #Lea broke all her arms. / #Lea broke every arm of hers.
b. Lea broke both her arms.

Percus (2006) and Sauerland (2008) argue that the anti-duality of *all* and *every* arises as an implicated presupposition due to competition with the dual universal lexical item *both*, which, via *Maximize Presupposition* (MP), makes a universal quantifier with no size restriction anti-dual.

Chemla (2007) raises a puzzle for this analysis. In French, the universal quantifier *tous* is also anti-dual (2-a). But French does not have a lexical item for 'both'. In fact, the most direct translation of 'both' is the complex definite numeral expression *les deux* ('the two') in (2-b).

(2) a. #Léa s'est cassé tous les bras.
Léa REFL.is broke all the arms
#'Léa broke all her arms.'

b. Léa s'est cassé les deux bras.
Léa REFL.is broke the two arms
'Léa broke both her arms.'

The French data in (2) constitute a problem for the competition-based account. First, *les deux* cannot be obtained as an alternative to *tous* using a standard Katzirian algorithm that assumes replacements of nodes of the same syntactic category (Katzir 2007). Second, as noted

[1] This paper addresses the same puzzles as Jeretič et al. (2024). We propose a reformulation of the theoretical proposal that, while minimally different, suggests a different answer to the question raised by Buccola, Križ, and Chemla (2018), namely whether there must exist conceptual alternatives.

by Chemla (2007), if we extend it to allow for *tous* to compete with *les deux*, it is a puzzle why it does not compete with another identically structured numeral expression like *les trois* ('the three'), which would produce an unattested anti-triality inference of *tous*.

Chemla suggests that the explanation of *tous*'s anti-duality lies in the existence of a dual 'core concept' that can participate in competition with *tous*. This observation has become one of the better-known examples suggesting the need for 'conceptual alternatives', that is, non-utterable meaningful objects that can compete with pronounceable linguistic material and be included in operations over alternatives (Buccola, Križ, and Chemla 2021). Nevertheless, no full-fledged account of the anti-duality of *tous* has yet been proposed. This paper takes on this challenge.

Chemla's (2007) puzzle suggests that there is a parallel between the anti-duality of *all* in languages which have a lexicalized dual counterpart *both*, like English, and the anti-duality of *all* in languages that don't, like French. However, we find a number of other items that are anti-dual in some languages, apparently due to the presence of a lexicalized dual counterpart, but are not anti-dual in other languages. A minimally different example to universal quantifiers involves negative quantifiers, which also have universal force. English negative quantifier *no* (also *none*) is anti-dual, as shown in (3-a), which can easily be explained by MP competition with its dual counterpart *neither*. French does not have a counterpart to *neither*, just like it does not have a counterpart to *both*; but French *aucun* ('no'/'none'), unlike *tous* ('all'), does not give rise to an anti-duality inference, as shown in (3-b). So whatever makes *tous* anti-dual in the absence of an overt dual counterpart does not apply to *aucun*.

(3) {#None, Neither} of the sides of this sheet of paper has been used.

(4) Aucun des côtés de cette feuille n'a été utilisé. (French)
no of.the sides of this paper neg.has been used
'Neither of the sides of this sheet of paper has been used.'

This type of observation extends to other quantificational items, such as interrogative *which*, which has dual counterparts in Icelandic and Japanese, and distributive *each* and existential *one*, which have dual counterparts in Japanese. Their plural equivalents exhibit anti-duality in those languages. For reasons of space we show the relevant data below only for *which* in Icelandic ((5); Jordan Chark, p.c.) and in Japanese ((6); native speaker intuition of one of the authors).

(5) a. Á hvor-um handlegg-num brotna-ði hún? (Icelandic)
On which.DUAL-DAT arm-DAT.DEF break.INT-PST she
'Which arm did she break?'
b. ?Á hvaða handlegg brotna-ði hún?
On which arm.DAT broke.INT-PST she

(6) a. Taroo-wa dotti-no ude-o o-tta-no? (Japanese)
Taro-TOP IND.DUAL-GEN arm-ACC break-past-Q
'Which arm did Taro break?'
b. #Taroo-wa dono ude-o o-tta-no?
Taroo-TOP IND arm-ACC break-past-Q

But in both English (7) and French (8), no anti-duality arises in any of these cases. Once again, this is illustrated below only for *which*, but the observations extend to *each* and *one*.

(7) Which arm hurts you?

(8) Quel bras te fait mal? (French)
which arm you cause pain
'Which arm hurts you?'

On a Chemla-inspired account in which dual is a core concept, we would expect that the

dual quantifiers in Japanese and Icelandic are lexicalizations of that core concept together with corresponding quantifiers. But then we would expect the possibility of that combination to occur in all languages, even those that do not lexicalize it, and generate anti-duality in the corresponding quantifiers, just like it does with French *tous*. Therefore, a proposal for the anti-duality of French *tous* should also be equipped to explain the absence of anti-duality with French and English *quel/which*, *chaque/each*, *un/one*.

As a final data point to consider, one may wonder specifically about the differences between universal quantifiers, where *all*, *every*, and *tous* are anti-dual, but not *each*, mentioned above, or definite plurals, the latter shown in (9) and (10) for English and French respectively.

(9) My arms hurt.

(10) Mes bras me font mal. (French)
my arm me cause pain
'My arms hurt.'

An account that simply has the dual as a core concept would struggle to explain the lack of anti-duality in all these cases. In this work, we provide an account that captures (i) the anti-duality of French *tous*, and its lack of anti-n-ality for $n > 2$, and (ii) the absence of anti-duality in other quantifiers, which might be expected to arise due to its presence in other languages.

2 The proposal

Our account will maintain Chemla's (2007) original idea that the anti-duality of *tous* is an implicated presupposition.[2] However, since French does not have a word for 'both', we need to find a competitor to *tous* which carries a dual presupposition. Once this competitor is found, the use of *tous* is predicted, via Heim's MP in (19), to implicate anti-duality, as observed.

A dual core concept. We follow Chemla's intuition that the number concept DUAL is special and provides the basis for an alternative to French *tous* to derive anti-duality.[3] We assume that dual number features are grammatically present in every language, but that they are sometimes homophonous with each other. In a language like Slovenian, it arises as morphologically distinct number features (11), whereas in others like French, it is not morphologically differentiated from plural (12).

(11) računalnik-a (Slovenian)
computer-DUAL
'the computers'

(12) les ordinateurs (French)
the computer.DUAL/PL
'the computers'

Furthermore, DUAL can combine with quantifiers to modify their domain. Sometimes, the result is lexicalized: English *both* is the lexicalization of ∀+DUAL. English *neither* is the lexicalization of ¬+∃+DUAL. Japanese *dotti* is an existential with DUAL, available in combination with other morphemes to create dual *one*, *which* and *each*.

[2]Evidence for anti-duality of *tous* as an implicated presupposition (as opposed to lexical specification), is that it needs not project universally in the scope of a universal quantifier (Sauerland 2008), in contrast to a typical presupposition (Chemla 2009; Heim 1983; Schlenker 2008, a.o.).

(i) *Context: Some candidates to a job have written only one paper, others two, the rest more than two.*
J'ai vérifié, chaque candidat a envoyé tous ses articles.
I.AUX checked each candidate AUX sent all their articles
'I checked, every candidate sent every paper of theirs.'

[3]See Aravind 2018 (section 4.5.3, pp. 135-139) for a similar solution. As far as we can see, however, Aravind's analysis would not predict the absence of anti-duality with other quantifiers as we saw in (7)-(8).

We assume that alternatives can be obtained by replacements of lexical items (Katzir 2007).[4] As a result, a structure with DUAL features is generated as an alternative to a structure with other number features, in any language. For French, the dual structures in (13-b) and (14-b) are alternatives to their plural counterparts in (13-a) and (14-a).

(13) a. les NP.PL
b. les NP.DUAL

(14) a. tous les NP.PL
b. tous les NP.DUAL

In the case of the definites in (13), MP applies to (13-a), resulting in an anti-dual expression. (13-b) is still available in contexts in which the referent of the definite consists of two individuals. The same process applies to the universally quantified expressions in (14). But, recalling our central puzzle, this means we need to block the parse in (14-b) (when the domain consists of just 2 individuals) from being realized as *tous les NP* (cf. (2-a)). We turn to this next.

Blocking the universal dual expression. We propose a principle in (15) that blocks the dual expression in (14-b).

(15) **Avoid Ambiguity.** Let S be a string which is ambiguous between two parses P1 and P2, and let S' be a string such that:
a. S' has a parse P1' equivalent to P1
b. S' has no parse P2' equivalent to P2
c. S' is syntactically at most as complex as S (complexity := number of nodes)
Then P1 is blocked from being pronounced as S (i.e. string S cannot realize P1).

Avoid Ambiguity blocks the parse in (14-b) due to the presence of the unambiguous string *les deux NP.DUAL/PL*, which has a meaning equivalent to (14-b) (see below), no meaning equivalent to (14-a), and is at most as complex as it. First, *les deux NP* and *tous les NP* have identical complexity, with (at least) three overt terminal nodes each.

(16) a. $[_{QP}\ [_{Q}$ tous $]\ [_{DP}\ \ [_{D}$ les $]\ \ [_{NP}$ NP $]]]$
b. $[_{DP}\ [_{D}$ les $]\ \ [_{NumP}\ [_{Num}$ deux $]\ [_{NP}$ NP $]]]$

As anticipated, our proposal crucially relies on there being semantic equivalence between sentences where *tous les NP.DUAL* (14-b) and *les deux NP* are replaced with each other. To illustrate how this semantic equivalence comes about, we consider in turn the strings *les deux verres sont pleins* ('the two cups are full') in (17) and *tous les verres.DUAL sont pleins* ('all cups.DUAL are full') in (18). To start with, we adopt the familiar view of the definite article to denote the maximal sum σ of individuals present in the extension of its argument (Sharvy 1980). We further take the extension of a predicate to contain both atoms and pluralities. Even though numerals are typically assumed to indicate a lower bound (e.g., 'at least 2'), and achieve an exact number reading (e.g., 'exactly 2') through exhaustification of higher-number alternatives, for the sake of simplicity we here shortcut to *deux* ('two') having the meaning 'exactly 2'. We

[4] See below for a complete definition (this merges definitions (18), (19), (20) and (41) of Katzir's (2007) paper).

(i) A **structural alternative** of a parse tree ϕ is a parse tree ψ obtained from ϕ by a finite series of deletions (removing edges and nodes), contractions (removing an edge and identifying its end nodes), and replacements of constituents in ϕ with lexical items of the same syntactic category or subtrees of ϕ.

The notion 'of the same syntactic category' is crucial for our purposes: this restriction entails that *les n NP*, for any numeral *n*, is not generated as an alternative to *tous les NP* because *tous*, a quantifier, is not replaceable by *les*, a determiner, and *les* is not replaceable by a numeral. Thus, *les deux NP* is not directly generated as an alternative by the Katzirian algorithm.

obtain (17-b) as the denotation of *les deux verres*. In (17-b) it composes with the VP *sont pleins* ('are full') via a distributivity operator D.

(17) a. $[\![$ les deux verres $]\!] = \sigma x.[cup(x) \wedge |\{y|atom(y) \wedge y \sqsubset x\}| = 2]$
b. $[\![$ les deux verres D sont pleins $]\!] =$
$\forall z.atom(z) \wedge z \sqsubset \sigma x.[cup(x) \wedge |\{y|atom(y) \wedge y \sqsubset x\}| = 2] \rightarrow full(z)$

Moving to the composition of *tous les NP.*DUAL, we take French *tous* to be a universal quantifier over contextual covers of a definite plurality (here we look at the special case of quantification over atoms). This semantics is based on the selectional properties of *tous*, which can only compose with an NP if it is plural-marked, like in English, and via a definite article, unlike in English. We further assume that DUAL means 'exactly 2' (to align with Harbour's (2014) proposal). We obtain (18-a) as the denotation of *tous les verres.*DUAL, and (18-b) for the entire string, which is equivalent in meaning to (17-b).

(18) a. $[\![$ tous les DUAL verres $]\!] =$
$\lambda Q.\forall z.atom(z) \wedge z \sqsubset [\sigma x.cup(x) \wedge |\{y|atom(y) \wedge y \sqsubset x\}| = 2] \rightarrow Q(z)$
b. $[\![$ tous les DUAL verres sont pleins $]\!] =$
$\forall z.z \sqsubset [\sigma x.cup(x) \wedge |\{y|atom(y) \wedge y \sqsubset x\}| = 2] \rightarrow [\forall y.atom(y) \wedge y \sqsubset z \rightarrow full(y)]$
$\equiv \forall z.atom(z) \wedge z \sqsubset [\sigma x.cup(x) \wedge |\{y|atom(y) \wedge y \sqsubset x\}| = 2] \rightarrow full(z)$

Deriving anti-duality. We have shown that a dual universal expression is generated as an alternative to the plural (number-neutral) structure, but that it is blocked from being realized due to Avoid Ambiguity. Now we make a crucial stipulation, namely that expressions generated through the Katzirian algorithm count as alternatives, even when they are blocked from being realized. This allows *tous les NP.*DUAL *VP* to be an alternative to *tous les NP.*PL *VP*, which then feeds MP competition between the two alternatives to derive anti-duality for the latter.

(19) ***Maximize Presupposition***
Do not use ϕ in context c if ψ is an alternative to ϕ such that:
a. ψ has a stronger presupposition than ϕ.
b. ϕ and ψ are contextually equivalent in c.

We show that a sentence containing *tous les NP.*PL and one containing *tous les NP.*DUAL in the same position are contextually equivalent in a context where their presuppositions are satisfied, and only differ in their presupposed content, thus allowing for MP to apply.

The meaning of *tous les NP VP* is in (20), and that of *les deux NP VP* repeated in (21).

(20) $[\![$ tous les verres.PL sont pleins $]\!] = \forall z.atom(z) \wedge z \sqsubset [\sigma x.cup(x)] \rightarrow full(z)$

(21) $[\![$ tous les verres.DUAL sont pleins $]\!] =$
$\forall z.atom(z) \wedge z \sqsubset \sigma x.[cup(x) \wedge |\{y|atom(y) \wedge y \sqsubset x\}| = 2] \rightarrow full(z)$

It is easy to see that the at-issue meanings between these two expressions are the same, i.e. that all cup atoms are full. The only difference between them is found in the restrictor of the σ operator, and thus the presuppositional component: (20) presupposes there is a maximal sum of cups, and (21), that there is a maximal sum of cups which contains exactly two atoms. MP applies: (20) and (21) are contextually equivalent when presuppositions are satisfied, and (21) has a stronger presupposition than (20). Therefore, if the number of atoms is known to be exactly two, the presupposition of the definite numeral expression is met, and the presuppositionally weaker *tous* expression is blocked.

3 Anti-Duality and its Absence with Other Quantifiers

We now show why anti-duality does not arise with other quantifiers. The dual is always generated as an alternative to the non-dual version, but in most cases, it is not blocked by *Avoid Ambiguity* from being realized. The reason is that in order for the dual expression to be blocked, there needs to be an expression equivalent in meaning and at most as complex as it. However, very often there is none.

Let us start with plural definites. *The NP.*PL generates *the NP.*DUAL as an alternative. However, they are not anti-dual in French nor English. This is because there is no expression equivalent to *the NP.*DUAL that is at most as complex as it. The closest equivalence would be the definite numeral expression *the two NP*, but that is already too complex.

Turning to negative quantifiers, English has a dual negative existential quantifier *neither*, which induces an anti-duality inference in the non-dual counterparts *no(ne)* (3). In contrast, negative quantifiers in French do not seem to carry anti-duality (4). This follows from our proposal. Indeed, while there is a dual alternative generated by applying DUAL to the domain of the quantifier, there is no unambiguous expression equivalent in meaning to it that is at most as complex. The smallest expressions with this meaning are *aucun des deux* ('none of the two'), or *ni l'un ni l'autre* ('neither one nor the other'), which are more complex than *aucun*.

As far as Icelandic and Japanese are concerned, recall that these languages express duality with quantifiers other than *all*, namely, *some*, *which*, and *each*, shown for *which* in (5) and (6). In addition, we observed that the non-dual counterparts to those quantifiers are anti-dual. But this anti-duality is not observed in English and French *some*, *which*, and *each*, which do not have dual counterparts. The answer is simple: even though the dual counterparts to *some*, *which* and *each* are generated, they are not blocked from pronunciation due to the absence of simple enough expressions meaning *some of the two*, *which of the two* and *each of the two*.

4 Conclusion

We propose a solution for French *tous*' anti-duality by proposing that the dual is a core concept that is grammatically present in all languages and serves as the basis for the dual competitor to *tous*. No anti-triality is generated, because there is no trial core concept. A dual expression is generated as an alternative to a non-dual one, but sometimes blocked by the Avoid Ambiguity principle, which posits that an ambiguous string can be rendered unambiguous by blocking one of its parses if there is another unambiguous string in the language equivalent in meaning and at most as complex. This is what happens to *tous les NP.*DUAL: there is the equivalent and simple enough expression *les deux NP* that blocks it from being pronounced. However, we also assume that MP competition with *tous les NP.*DUAL is still licensed, despite it being blocked from being realized, which allows *tous les NP.*PL to be anti-dual. Other expressions have their dual counterparts generated as alternatives, but they are not blocked by Avoid Ambiguity when the language lacks a simple enough equivalent expression. This is the case, for example, for *the, each, which* in English and French, and French (but not English) *aucun* ('no').

Zooming out, this appears to corroborate the claim that Conceptual Alternatives must exist as defined by Buccola, Križ, and Chemla 2018. However we would like to remain cautious about this conclusion: note that the 'conceptual' (i.e. unpronounceable due to Avoid Ambiguity) alternative in our analysis is in some sense replaced by an equivalent pronounceable expression in the language. In other words, the meaning denoted by the conceptual alternative is still expressible. Could it be that competition is only licensed when there is such an expression, and thus maintaining the Gricean intuition that alternatives are pronounceable? This is a question that can only be answered by looking at further cases of conceptual alternatives.

References

Aravind, Athulya (2018). "Presuppositions in context". PhD thesis. Massachusetts Institute of Technology.

Buccola, Brian, Manuel Križ, and Emmanuel Chemla (2018). "Conceptual alternatives: Competition in language and beyond". In: *Paris: ENS*.

— (2021). "Conceptual Alternatives: Competition in Language and Beyond". In: *Linguistics and Philosophy* 45.2, pp. 265–291. DOI: 10.1007/s10988-021-09327-w.

Chemla, Emmanuel (2007). "French *both*: A gap in the theory of antipresupposition". In: *Snippets* 15, pp. 4–5.

— (2009). "Presuppositions of quantified sentences: Experimental data". In: *Natural language semantics* 17, pp. 299–340.

Harbour, Daniel (2014). "Paucity, abundance, and the theory of number". In: *Language*, pp. 185–229.

Heim, Irene (1983). "On the projection problem for presuppositions". In: *Formal semantics–the essential readings*, pp. 249–260.

Jeretič, Paloma et al. (2024). *Core Concepts and Indirect Alternatives: On the Anti-Duality of Quantifiers*. URL: https://ling.auf.net/lingbuzz/007694.

Katzir, Roni (2007). "Structurally-defined alternatives". In: *Linguistics and Philosophy* 30.6, pp. 669–690. DOI: 10.1007/s10988-008-9029-y. URL: https://doi.org/10.1007/s10988-008-9029-y.

Percus, Orin (2006). "Antipresuppositions". In: *Theoretical and empirical studies of reference and anaphora: Toward the establishment of generative grammar as an empirical science* 52, p. 73.

Sauerland, Uli (2008). "Implicated Presuppositions". In: *Sentence and Context*. Ed. by Anita Steube. Berlin, Germany: Mouton de Gruyter.

Schlenker, Philippe (2008). "Be Articulate: A pragmatic theory of presupposition projection". In: *Theoretical Linguistics* 34.3, pp. 157–212. DOI: doi:10.1515/THLI.2008.013. URL: https://doi.org/10.1515/THLI.2008.013.

Sharvy, Richard (1980). "A more general theory of definite descriptions". In: *The philosophical review* 89.4, pp. 607–624.