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What causes languages to be transparent?



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ABSTRACT

There is a long tradition in linguistic research (Antilla, 1972; Dressler, 2005) arguing that one-to-one correspondences between form and meaning are somehow more 'natural', 'optimal' or at least simpler than structures lacking such transparent correspondences. Also recently, it has been argued (e.g. Leufkens, 2013) that in general creole-languages adhere more to such a principle than non-creole languages.

In this paper I argue that transparency when found anywhere in languages must be considered from the perspective of learning strategies rather than from the perspective of the computational system. I first argue that transparency is not a principle of grammar. On the contrary, the mapping between the (morpho-)syntax and the phonology in natural languages is characterized by mismatches between structure and form. Consequently, the idea that a transparent mapping is somehow 'optimal' is, at least from the perspective of the grammar, misguided. This raises the question why it seems to be the case that transparency is a tendency that may be observed in contact-languages. I answer this question by invoking the Mutual Exclusivity Principle (Merriman and Bowman, 1989) known from word-learning by children, which roughly entails that forms that have been assigned a meaning by the language learner, will not be used in different meanings. *Vice versa* references that have a particular form will not be expressed by another form. This principle is perfectly in line with transparency. Recently, it has been shown that the Mutual Exclusivity Principle is also operative in other mammals, so we can safely assume that it belongs to more general rather than task-specific cognitive mechanisms. Furthermore, I claim that the Mutual Exclusivity Principle works on stored items only. Since second language acquisition plays a central role in the formation of creoles (Lefebvre et al., 2006; Veenstra, 2009; Muysken, 2013) and since, generally speaking, second language learners rely more on declarative knowledge ('storage') than on procedural knowledge ('computation') (see e.g. Blom et al., 2008), I argue that the effect of the Mutual Exclusivity Principle will be greater in second language acquisition than in first language acquisition. As a result we may see a tendency towards transparency in contact languages.

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1. Introduction

There is a long tradition in linguistic research (Antilla, 1972; Dressler, 2005) arguing that one-to-one correspondences between form and meaning are somehow more 'natural', 'optimal' or at least simpler than structures lacking such transparent correspondences. The idea seems to be that language in its purest form would not allow complexities that encumber the relation between form and meaning. In this paper, I would like to propose a different view. I claim that any observed transparency of this type results from a more general cognitive mechanism, rather than assuming that simplex one-to-one correspondences between form and meaning are part of the core of the linguistic system. Moreover, I think there are

strong indications that this general cognitive mechanism is not specific to humans. I hope to show that *grammars*, in a narrow sense to be made clear below, do not seem to care much about one-to-one correspondences between meaning and form or, more generally, between different levels of representation. This implies that if we find patterns of transparency in languages, they should result from other factors (e.g. age of onset with correlating learning strategies, nature of input, monolingual vs. multilingual context).

Chomsky (2005) distinguishes three factors in language design. The first factor is the human genetic endowment, i.e. Universal Grammar (UG, hereafter). The second factor is experience, which may lead to variation within relatively narrow limits defined by UG (i.e. informally speaking, differences between ‘languages’). Thirdly, Chomsky separates language-external factors among which “principles of data-analysis that might be used in language acquisition” and “principles of structural architecture [...] including principles of efficient computation, which would be expected to be of particular significance for computational systems such as language” (Chomsky, 2005: 6). I submit that ‘transparency’, in as far as it is true of languages (see the discussion in Section 2), is a principle that belongs to the third factor and is required to allow some computational efficiency.

Leufkens (2013), who proposes to separate the notion ‘transparency’ from the much broader notion ‘complexity’, finds that contact languages are more transparent when compared to languages that do not share their particular histories of origin. If transparency is not part of UG, the question is what the source is for this apparent force towards more transparency and why this force leaves its marks particularly in contact languages. I submit that the Mutual Exclusivity Principle¹ (Merriman and Bowman, 1989) which is known from research in child word-learning, plays a crucial role in the explanation. This principle roughly entails that children (or other subjects) will not use forms with previously assigned meanings to refer to something new, and, *vice versa*, references that have been given an expression will not be expressed by another form. This principle does not seem specific to language and is not part of the first factor, but seems a far more general learning principle part of the third factor. Moreover, the principle is also not human-specific, since it has been found to be operational in dogs (Pilley and Reid, 2011).

Leufkens (2013) claims that so-called creole languages are more transparent than non-creoles. Similarly, other empirical studies have appeared claiming that creole languages can be successfully separated from other languages (Parkvall, 2008; Bakker et al., 2011). For example, Bakker et al. construe phylogenetic networks on the basis of a large number of ‘structural features’ of a balanced sample of languages and show that the creole languages in the sample form a group. They conclude: “Whether one takes creole properties and looks for those in non-creole languages, or whether one takes a set of typological properties used for typological research, and then looks at a sample with creoles and non-creoles, the results are the same: *creoles stand out*.” (Bakker et al., 2011: 35). In the same vein Leufkens (2013) concludes: “All contact languages ‘gained’ transparency with respect to their source languages: many non-transparent features of the source languages are lost so that the contact languages turn out to have a higher degree of transparency compared to their sources” (Leufkens, 2013: 357). These controversial claims have been disputed in the creolist literature (Braun and Plag 2003; Kouwenberg, 2010, 2012; Fon Sing and Leoue, 2012; DeGraff 2001; DeGraff et al., 2013; Aboh, 2015, 2016), and one may wonder how we may explain such empirical results if we acknowledge at the same time that a realistic view of language should take into account that “[...] contact of some degree is ubiquitous in language” (Ansaldo, 2004: 490) and that such realistic view is contrary to the idea that passing *in toto* of a language as a system is the normal situation.

I would like to suggest that at least part of the success of empirically separating contact languages from others, might be due to the particularities of second language acquisition (henceforth: L2A) that plays an important role in the emergence of contact languages. In DeGraff’s (2002: 391) L2A-L1A cascade hypothesis, for instance, “second-language acquisition and first-language acquisition play distinct and complementary roles in various stages of creole genesis, with the (substrate-influenced) output of second-language acquisition playing a key role in defining the primary linguistic data in subsequent first-language acquisition” (see also Aboh, 2015). I will suggest that there are reasons to believe that the force of the Mutual Exclusivity Principle is stronger in second language acquisition than first language acquisition due to the particularities of the former process. The idea is that if we fully understand how second language acquisition differs from first language acquisition, this will allow us to see why some principles of learning not specific to language may leave their mark on languages that result predominantly from second language acquisition.

The central reasoning of this paper runs as follows. Following work by DeGraff (2002) and Aboh (2015) I assume that in situations of contact, different types of language learners may play a role in the formation of a new language, including L2-learners and bilingual speakers (2L1) (Lefebvre et al, 2006; Veenstra, 2009). Features of both languages in contact may be chosen to be part of a newly arising grammar. Furthermore, I assume that language learning is subject to a ‘critical period’ in the sense that it comprises several sensitive periods, each one for a different part of the mainly inflectional system of the language (see e.g. Meisel, 2008, 2011). Once the critical window for the acquisition of some inflectional property closes, the L2-learner has to rely on general cognitive mechanisms to acquire the system in question. Consequently, such inflectional elements will be vulnerable in the transmission to later generations especially in contact situations where L2-learners play a central role in the transmission. Given these assumptions, it is to be expected that these contact languages reflect these general cognitive principles to a larger extent compared to their non-contact neighbors.² More specifically, if the Mutual

¹ See also Clark, 1987 for a very similar idea, called the “Principle of Contrast”.

² Given these assumptions, we should not exclude situations of contact involving predominantly L1 learners. In these cases, we don’t expect these general cognitive principles to play a more important role. Aboh (2015) argues that certain aspects of creoles can only be accounted for if we assume the presence of L1 bilingual learners who were able to acquire the target European languages, while acquiring the creole simultaneously.

Exclusivity Principle is a general cognitive device that steers L2-learners in their acquisition process, then the result of that steering may be reflected in contact languages to a larger extent than in non-contact languages.

In the model of grammar that I will adopt for concreteness sake, the place where abstract ‘function’ gets form is during a stage in the derivation that is referred to as ‘spell-out’, which is located at the interface between syntax and phonological form. This is generally considered to be a central concern of morphology. Consequently, the focus of this paper will be on the morphology of languages.

The paper is organized as follows. In Section 1, I will show two things; first, I will argue that only theories that assume morphology to be ‘additive’ and, in principle, compositional, may allow for transparency. I will illustrate this point by showing that Construction Morphology allows for types of rules that disrupt compositionality and therefore transparency. In doing so, I also illustrate a second point: the transparency of a particular morphological system is dependent upon one’s analysis of that system.

In Section 2, I will show that the direction that morphological theory has taken is motivated precisely by mismatches between the morpho-syntactic level of representation and the phonology of a language. The phonology does not directly reflect the morpho-syntactic structure. On the contrary, languages employ different means to ‘package’ the morpho-syntactic information into phonological forms. Realizational models of morphology were developed precisely to account for such mismatches. There are many cases in which the morphology is clearly non-transparent and still this does not seem to overload or disrupt the computational system. The conclusion of this section is that transparency cannot be a part of the grammar. Hence, it cannot be a principle of the first factor.

In Section 3, I will argue that transparency is strongly related or maybe even identical to the Mutual Exclusivity Principle known from the acquisition of lexical forms. It turns out that this principle is also operative in non-humans. I take it that this very general cognitive principle is part of the third factor of language design in Chomsky’s (2005) terms.

In Section 4, I will ask why Leufkens (2013) can be successful in characterizing creole languages as (more) transparent (assuming that her analysis is on the right track). Given the result of Section 2, this is a surprising result because if transparency is not part of the grammatical principles, how can it still have an impact on some languages? I submit that the answer to this question lies in the combination of two separate conditions. First, some contact languages are to a large extent formed by L2-learners. Second, L2-learners have been generally shown to rely more on declarative knowledge than procedural knowledge (see e.g. Blom et al., 2008), whereas L1-learners rely primarily on procedural knowledge. As a consequence the Mutual Exclusivity Principle will have more chance to take effect in L2-learning. Ultimately this will yield more one-to-one mappings for form and meaning, resulting in a somewhat more ‘transparent’ morphosyntax in these contact languages.³ In Section 5, I conclude.

2. Transparency

In this section I will first show that the notion of transparency can be defined in terms of reliable correspondence between two levels of representation. Therefore, if we want to investigate to what extent languages are transparent, we need to discard those models of grammar that do not assume that language consists of pairwise correspondences between elements of form and elements of meaning. Such models do not allow for compositionality that is a prerequisite for transparency. Note, however, that measuring transparency depends on one’s linguistic analysis of a particular phenomenon.

Hengeveld (2011) defines transparency somewhat informally as a one-to-one relation between two levels of representation. He frames the discussion in the context of Functional Discourse Grammar (Hengeveld and Mackenzie, 2008) with its multi-layered structure in which elements of one level correspond to elements of the next level. Leufkens (2013) aims to show that this notion separates ‘contact languages’ from languages spoken within a relatively homogeneous community over a long period of time. The idea that languages ‘ideally’ conform to a one-to-one mapping between form and meaning seems to be deeply rooted in the (historical) linguistic tradition. Antilla claims that: “The higher, more general principle of one meaning, one form is as old as European linguistics” (Antilla, 1972:107). A fully transparent language would be a language in which each element of form would correspond to one and the same meaning and *vice versa*. Clearly, this is generally not the case; languages have lots of homonyms, are replete with ambiguity, and there are hardly any inflectional systems without syncretisms or redundancy (Matthews, 1974; Bobaljik, 2008). Likewise, derivational affixes are very often prone to polyfunctionality (see e.g. Beard, 1995; Booij, 1996), etc. So, if transparency is indeed a factor in the design of language, then it is a property that is not immediately visible. But of course the principle could operate at deeper levels of linguistic analysis.

So, rather than looking at some, maybe superficial, properties of languages we will have to look deeper into the systems that natural languages employ to map meaning to phonological form. And, in order to be able to decide whether a particular system is transparent, I propose to define transparency (in line with Hengeveld, 2011) somewhat more formally in (1) and (2).

³ Another external reason for less complexity in contact-languages is discussed by Aboh and Ansaldo (2007). They observe a major effect on the formation of contact-languages if the languages involved are typologically distinct (in terms of being isolating, agglutinative or polysynthetic). Much of the morphological shape of the Caribbean creoles can be predicted by looking at the type of languages in contact: semi-agglutinating (English/Romance) and isolating (Kwa).

A language is seen as consisting of two or more levels of representation. Each representation at a particular level corresponds to a representation at another level.

(1) a. *Correspondence*

Given two representations (A1, B1), each at a different level of representation (A, B), there is a correspondence relation $R(A1, B1)$ iff for every a_i , element of representation

$A1 = \{a_1, a_2, a_3, \dots, a_n\}$, there is a corresponding b_i (its 'form'), element of representation

$B1 = \{b_1, b_2, b_3, \dots, b_n\}$, and iff for every b_i , element of B1, there is a corresponding a_i (its 'meaning'), element of A1

b. *Reliability*

Given a correspondence between two representations $R(A1, B1)$, each individual mapping between a_i , an element of A1, and b_i an element of B1 is said to be reliable iff for all instances of a (at A) the same element b at B is found and iff for all instances of b (at B) the same corresponding element a is found at A

(2) *Transparency*

Language L is transparent, iff all levels of representation *correspond* to each other (in the manner defined in 1a), and iff all mappings are *reliable* (in the manner defined in 1b)

To illustrate, some relations that are not transparent according to these definitions are given in (3):

(3) a.	A: P Q	b.	A: P
	B: p		B: p q
c.			
	A: P Q P R		d. A: P Q P X
	B: p q x r		B: p q p q

In (3a) and (3b) the different levels of representation A and B do not correspond; there is no correspondent for Q in (3a) or q in (3b). In (3c) the levels of representation nicely correspond but there is no reliability: sometimes P maps onto p and sometimes onto x. The same holds for (3d); here q sometimes maps onto Q and sometimes onto X.

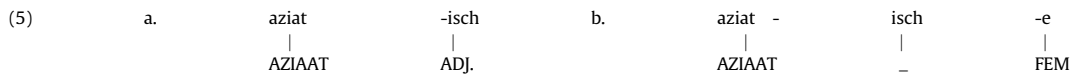
It is important to note that there is a certain analytic freedom for linguists to remedy the non-corresponding cases in (3a) and (3b). Some linguists will be happy to assume a zero at either level, which would make the levels correspond. Also, in (3c) and (3d) it could be argued that p and x in (3c) are accidentally synonymous (assuming for the moment that p and x belong to some 'form'-level and P and Q to some 'meaning'-level). To the extent that one allows for such analytic freedom, the notion of transparency is dependent on one's particular linguistic analysis.

I now turn to a concrete example of a grammatical model, i.e. Construction Morphology (CM hereafter) that serves to illustrate the minimum conditions for transparency to exist. Since CM allows for non-corresponding levels, there is no transparency to begin with. In order to illustrate the model I will directly turn to a concrete analysis. Booij (2010: 35) gives the following data from Dutch:

(4)	<i>inhabitative</i> Provençaal Amerikaan Guatemalteek Chileen Portugees Ambonees Romein Palestijn Breton Aziaat Monegask Israeliet Moskoviet	<i>toponymic adjective</i> Provençaal-s Amerikaan-s Guatemalteek-s Chileen-s Portugees Ambonees Romein-s Palestijn-s Breton-s Aziat-isch Monegask-isch Israeliet-isch Moskoviet-isch	<i>female inhabitative</i> Provençaal-s-e Amerikaan-s-e Guatemalteek-s-e Chileen-s-e Portuge-s-e Ambone-s-e Romein-s-e Palestijn-s-e Breton-s-e Aziat-isch-e Monegask-isch-e Israelit-isch-e Moskoviet-isch-e
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Booij observes that “the female inhabitative is formally derived through attachment of the female suffix *-e* (schwa) to the toponymic adjective, even though they express the meaning ‘female inhabitant of’” (Booij, 2010:35). As we can observe, any allomorphy present in the toponymic adjective is also present in the female inhabitative. Moreover, any allomorphy present in the inhabitative also carries over to the toponymic adjective. So, for Booij the point is that there is no semantic relation between ‘female inhabitative’ and the ‘toponymic adjective’, but despite this fact, the female inhabitative is as to its form, clearly derived on the basis of the adjective.

Schematically, we may represent the situation as in (5), where there is a correspondent of *-isch* at the morpho-semantic level in the adjective (5a), but not in the female inhabitative (5b):

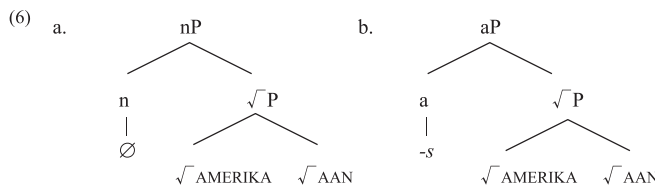


This entails that the phenomenon is analysed as non-transparent. The reason is that according to Booij one cannot decompose the meaning of ‘female inhabitative’ in corresponding elements at the formal representation. Such decomposition is a prerequisite for a construction to be transparent.

What does this tell us? First, if the above reasoning is correct, then there is only a potential role for transparency if language is compositional. Since transparency is a stronger notion and includes compositionality, analyses that allow for non-compositionality immediately lead to non-transparency.

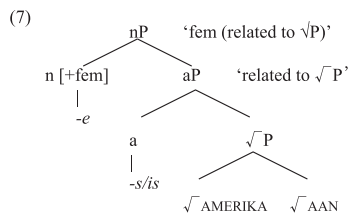
Second, it also shows – although this may sound trivial – that transparency is dependent on one’s linguistic analysis. If one – and in fact, we will do so immediately below – offers a compositional analysis of the female ‘inhabitative’ in Dutch, this may also turn out to be a transparent phenomenon.

I will illustrate this second point by giving an alternative for the analysis presented by Booij. Don and Lin (2014) have argued that the underlying structure of the Dutch female ‘inhabitative’ is as in (6):



As a first step towards this analysis, Don and Lin (2014) argue that adjectives such as *amerikaans* are directly built from a complex root that consists of the toponymic root ($\sqrt{\text{AMERIKA}}$) plus a root-affix ($\sqrt{\text{AAN}}$) (see Lowenstamm, 2015 for the idea of affixes-as-roots). This complex root can be nominalized (leading to the neutral inhabitative *amerikaan* ‘american’) as in (6a) or, as is the case in (6b), can be ‘adjectivized’ (*amerikaan-s* ‘american’). In this analysis the identical allomorphy of neutral inhabitatives and adjectives is explained by the fact that both are built from the same (complex) root.

Second, the idea of Don & Lin’s analysis is that the semantics of the adjective is preserved in the female inhabitative (the nP in (7)).



Informally, the semantics of the adjective (the aP in (6) and (7)) can be paraphrased as ‘related to x’, where x is the toponym. The semantics of the female personal noun (the nP in (7)) is simply ‘female n related to toponym’. The interpretation ‘female inhabitant’ is not grammatically encoded but is simply the most salient pragmatic interpretation for this semantics (see Aronoff, 1980). A female related to a country is in most cases the female inhabitant of such a country.

Following a suggestion by an anonymous reviewer we may even go one step further and assume that the schwa realizes a nominal head, rather than the female nominal head. It has been argued in the literature (e.g. Zonneveld, 1986) that this suffix is the same suffix as the adjectival inflection. The fact that ‘female inhabitant’ is often the most salient reading is then simply due to pragmatics. The (more specific) forms in the left-hand column of (4) block the reading ‘female inhabitant’. The crucial point here is that the analysis of Don & Lin is compositional, contrary to the one proposed by Booij (2010) in (5).

3. Non-transparency

In this section we will show that the one-form one-meaning principle conflicts with fundamental insights of much of recent theorizing. I will show that precisely recurrent types of mismatches between morpho-phonology and morphosyntax have led researchers to propose models of morphology that allow for these mismatches. The architecture of these theories is

precisely motivated by the existence of such cases of non-transparency. I take this as evidence for the claim that transparency does not belong to Chomsky's first factor of language design.

In current analyses of complex morphological systems as proposed by realizational models such as Distributed Morphology (Halle and Marantz, 1993; Harley and Noyer, 1999) (DM hereafter) and Nanosyntax (Caha, 2009), languages may package relatively large chunks of morpho-syntactic information in single affixes. According to DM, this morpho-syntactic information is present in the syntax as feature bundles, while in Nanosyntax it is conceived of as a number of contiguous hierarchically organized nodes in a tree. Let us first somewhat abstractly clarify the problem for the notion of transparency in DM and then turn to Nanosyntax. Note that both DM and Nanosyntax, contrary to Construction Morphology as we have seen in the previous section, conform to the principle of correspondence as defined in (1a). Both DM and Nanosyntax build a morpho-syntactic representation consisting of pieces that receive a phonological (and semantic) interpretation.

DM assumes that inflectional information originates in syntax. Any features specifying inflectional categories such as case, number, gender, person, mood, aspect, tense, etc. originate in the syntax as separate functional projections. Spell-out is the operation that 'realizes' this syntactic representation as a phonological form. Mediating between the syntactic representation and the phonology are so-called Vocabulary Items (VIs) that 'map' part of the morpho-syntactic representation on fixed pieces of phonology, i.e. the affixes. Transparency in this model would mean that VIs always realize the same piece of structure by the same phonological form and *vice versa*. However, this is not the case. There are several reasons for the breakdown of this one-to-one mapping. First, an important insight of these realizational models, that dates back to Anderson (1992), and is further extensively argued for by Beard (1995), is that spell-out is organized by disjunctively ordered rules that have a so-called 'default', or 'elsewhere' rule if no other rule applies. This rule-ordering is one of the sources of syncretisms. I will illustrate this with an abstract example below.

(8)	a.	features:	{F1, F2, F3}
	b.	VIs:	/a/ ↔ [F1] /b/ ↔ [F2] /c/ ↔ []

The form /c/ in (8b) surfaces in contexts that are not positively characterized for either F1 or F2; so, whether or not F3 is present in the morpho-syntactic representation, is immaterial to the morpho-phonology of this language: all forms, whether or not containing F3, are marked in the same way as they lack the features F1 and F2. This is the 'elsewhere'-case. Moreover, since the rules in (8b) are disjunctively ordered, all forms that both have F1 and F2 will be realized as /a/, since this rule has precedence over the rule realizing F2. Only in case [F2] is present without [F1], the form will be realized as /b/. This leads to different types of violations of transparency, illustrated in (9):

(9)	morpho-syntactic representation:	[F1]	{[F1],[F2]}	{[F1],[F2],[F3]}
	phonological representation:	/a/	/a/	/a/
	morpho-syntactic representation:	[F2]	{[F2],[F3]}	
	phonological representation:	/b/	/b/	
	morpho-syntactic representation:	[F3]		
	phonological representation:	/c/		

The organization of rules in disjunctive blocks opens up the possibility of leaving VIs partly or completely underspecified. The motivation for this disjunctive organization of spell-out rules comes from syncretism that we find in many inflectional paradigms whether they concern case-marking, tense-marking, person-marking, etc.

Now let us assume for the moment that transparency is an element of the first factor. Given our definition above, this implies that at the point of spell-out there should be a reliable correspondence between phonological form (let's say an affix) and morpho-syntactic function (some feature-matrix). If this were the case, then the prediction would be that in general a lexical analysis of inflectional morphology would work fine. In a lexical model of inflectional morphology, the elements that constitute the complex words (i.e. affixes) would be the source for the inflectional features. In a transparent language, each affix would neatly correspond to a particular feature combination. Bringing such elements into the computation and merging them, would lead to a unification of their features. They could then percolate in some manner to the top-node, to be read off by the syntax. Lexical analyses of this type have been proposed in the early days of generative morphology. For example Jensen and Stong-Jensen (1984) provide an analysis along those lines of the complex system of Georgian verbal inflection. However, it turns out that these lexical analyses fail once confronted with such complex inflectional systems as Georgian. In order to work, they need to be complemented with different types of additional theoretical constructs (default insertion of features, extra rules that insert features, homonymy of affixes) in order to fix incomplete feature matrices that would arise if one would completely rely on the lexical feature-specification of affixes and their unification. The reason for this failure is that affixes are often underspecified for the morpho-syntactic features that they realize. So, precisely because languages are not transparent, such lexical models are abandoned giving rise to 'realizational' models that spell-out or realize inflectional features originating in syntax.

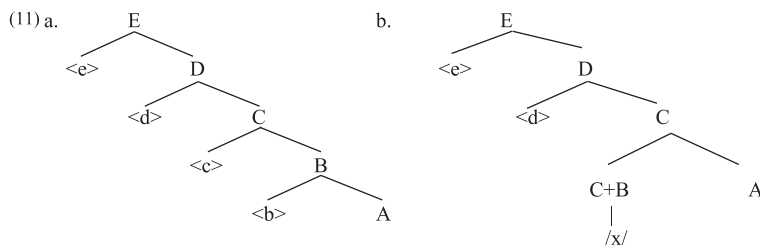
A second source for structural mismatches between syntax and its realization comes from ‘fusion’. Let us briefly illustrate fusion empirically on the basis of a simple example from Latin:

(10)		<i>sing.</i>	<i>plur.</i>
	<i>nom</i>	ros-a	ros-ae
	<i>acc</i>	ros-am	ros-as
	<i>gen</i>	ros-ae	ros-arum
	<i>dat</i>	ros-ae	ros-is
	<i>abl</i>	ros-a	ros-is

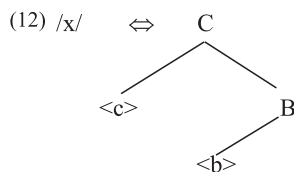
There is no separate ending for number and case in the Latin nominal paradigm. Instead, each slot in the paradigm defined by *number* × *case* has a single realization. Apparently, what is two separate functional heads in syntax (number and case) is fused into a single slot before their realization.

Consider the structure in (11a). If all functional heads {b, c, d, e} would receive a separate spell-out, this situation could in principle lead to a transparent mapping onto the phonology. However, ‘fusion’ describes the situation in which several nodes are spelled-out by a single affix. Such fusion of two syntactic nodes that are realized by a single affix is a common situation in languages, which clearly violates transparency as defined above.

In DM fusion would comprise an operation on the syntactic structure (such as (11a)) that would merge two heads (e.g. and <c>) either via Lowering (of to <c>) (see Embick and Noyer, 2007) or via Head-to-head-movement ((of <c> to), creating a structure such as (11b). The merged heads would then be spelled out by a single affix.



In Nanosyntax (Starke, 2009) there is no merging of functional heads prior to spell-out. In order to account for the fused paradigms, this theory employs ‘phrasal spell-out’ (see also Caha, 2009; for earlier proposals on phrasal spell-out see e.g. Weerman and Evers-Vermeul, 2002; Neeleman and Szendroi, 2007). The core idea of these proposals is that also non-terminals may be realized. The realization of (11a) for example, would be mediated by a lexical item such as (12) that maps onto a contiguous part of the structure:



Phrasal spell-out renders special syntactic fusion operations superfluous. However, the point here is that, whether one wants to analyze such phenomena in terms of ‘phrasal spell-out’ or in terms of movement, there is abundant empirical evidence for ‘fusion’ in natural language. This phenomenon entails that morphosyntax and morphophonology are not in a transparent relation but that two nodes at the morphosyntactic level correspond to a single morpho-phonological item.⁴ Apparently, such mismatches do not pose a particular problem for the first language learner; languages show these types of mismatches frequently. For example, Caha (2009) shows that case syncretism should be understood in terms of phrasal spell-out, and Weerman and Evers-Vermeul (2002) as well as Neeleman and Szendroi (2007) show that forms of personal pronouns can be understood in terms of the realization of non-terminals.

Finally, I just mention haplology as yet another source for potential mismatches between morphology and phonology.

Briefly summarizing this section, I hope to have shown that the idea that Transparency, as defined in (1), cannot be a part of Chomsky’s first factor of language design. Mismatches between form and meaning are the rule rather than the exception in the morphology of natural languages. Recent theories that model the relation between syntax and phonology such as

⁴ Note that any instance of movement (or any remerger) entails a mismatch since the moved element will be related to two structural positions. Since our focus is here on the morphology, we leave these issues further untouched.

Distributed Morphology and Nanosyntax incorporate several devices precisely to allow for certain types of mismatches between structure and form.

4. Transparency as Mutual Exclusivity

Recall from the introduction that [Chomsky \(2005\)](#) distinguished three factors in language design: next to the inborn capacity of man to acquire language (i.e. UG), and the environment that will largely determine the outcome of the language acquisition process, there is a third factor that includes principles of data-analysis and efficient computation. Section 2 argues that, transparency cannot be a principle belonging to the first factor. So, we find ourselves in a somewhat difficult situation since on the one hand our brief investigation shows that transparency has no role to play in the structure of language, whereas on the other [Leufkens \(2013\)](#) provides evidence for the claim that creoles show a higher degree of transparency than non-contact languages. The question thus becomes urgent how this result is possible if transparency cannot be part of the first factor of language design? Put differently, what is the source for the observed relative transparency?

If we are right in arguing that transparency does not belong to the first factor of language design, and it is certainly not a factor that is part of the environment (or input), then we may ask whether transparency is somehow a more general cognitive principle that is part of the third factor. For the moment I set aside the question how this may effect the design of language, and of contact-languages in particular. I will get to this issue in Section 4. I will first argue that there is reason to believe that transparency is indeed a principle belonging to the third factor.

Research on word learning has shown that there is an important role for the so-called Mutual Exclusivity Principle ([Merriman and Bowman, 1989](#)). A child, on being prompted to assign a new name to a particular object, will show great hesitation to do so if it already has another name for that particular object. Instead, it will try to pick out a particular part or property of the named object to assign the new name. [Merriman and Bowman \(1989: 1\)](#) propose “[...] children are disposed to construct mutually exclusive extensions of the terms they acquire.” It is easy to see that such a principle, when fully respected, comes down to a one-to-one correspondence between form and meaning for words.

Mutual Exclusivity, that has been shown to help children in acquiring word-meanings (see also e.g. [Markman and Wachtel, 1988](#); [Markman et al., 2003](#)), might even be a more general cognitive principle. [Harley \(2014\)](#) points out that the Mutual Exclusivity Principle can be seen in operation in other species’ learning of sign-symbol mappings.⁵ There is evidence from a border-collie that has acquired a little over 1000 form-meaning pairs, that this dog also obeys the Mutual Exclusivity Principle. Apparently then, this principle is not specific to humans ([Pilley and Reid, 2011](#)).

It is important to note that the Mutual Exclusivity Principle operates in acquiring the meaning of forms. As has been tested this will help children in ‘normal’ first language acquisition (henceforth: L1A) to more easily extend their vocabulary. However, from Section 2 we may conclude that this principle is not operative, or at least can be easily overridden, when it comes to the assignment of functional meanings to ‘smaller’ Vocabulary Items such as affixes. As we have seen there is no such avoidance of homonymy during Vocabulary Insertion, there is fusion, haplology, zero-affixation, etc., nor do children invent distinctive inflectional morphology to distinguish between person-number features of the verb, say, for instance in English. It seems to be the case that the Mutual Exclusivity Principle is only relevant in the learning of content words, i.e. members of the lexical categories N, A and V.

I have argued that transparency as defined in (1) and (2) cannot be part of the design of language. However, from the literature on word-learning we know that there is a much more general cognitive principle that is operative (amongst others) in word-learning and that prevents children from assigning ‘labels’ (or ‘names’) to meanings that already have a label. Taking the results of [Leufkens \(2013\)](#) seriously, we now face the question how this principle may be helpful in explaining the transparency of creoles, as opposed to non-creoles. I take up this issue in Section 4.

5. Why could contact languages show some degree of transparency?

Before I turn to the question how we may explain [Leufkens’](#) results, I first want to stress that these results should not be taken to imply that creole languages can be successfully characterized as being fully transparent. For example, the creole language Haitian has only one form *nou* that encodes both 1PL and 2PL. So, a sentence like *nou ale* can both mean “we/you-PL went” (see [Aboh, this volume](#)). In the same language the form *ap* can be future or progressive. Accordingly, the sentence *Mwen ap manje* may both mean “I will eat” or “I am eating” ([DeGraff, 2007](#); [Glaude, 2012](#), and references therein). Rather, it seems to be the case that certain mismatches between form and meaning are generally speaking less abundant in contact-languages than in languages that do not share such a history. So, we probably best characterize contact-languages as showing a tendency towards a more transparent mapping between form and function.

In this section I would like to formulate a suggestion for future research that could explain such tendency. The suggestion I propose rests on several assumptions: First, as said above, in the formation of contact-languages L2-learners of different age may play a role next to bilingual speakers (see [DeGraff, 2002](#); [Aboh, 2015](#)). Furthermore, L2-learners differ to some extent from L1-learners in the sense that they will have to learn certain (especially inflectional) properties in a different way than L1-language learners (see [Meisel, 2008](#)). This will have a serious effect on the attainment of these

⁵ However, [Harley and Tubino Blanco \(2013: 8\)](#) concludes “If true root suppletion exists, as suggested by the data above, it must be the case that the Mutual Exclusivity assumption is just a heuristic, rather than a hard-and-fast, inviolable principle.”

properties. Given the right circumstances (see [Aboh, 2015](#)), the result of this L2A may be passed on to new learners and, consequently, to new generations.

More in particular, when it comes to the acquisition of properties that lack direct reference, L2-learners have been shown to rely on declarative knowledge rather than on procedural knowledge, whereas L1-learners rely more on procedural knowledge ([Blom et al., 2008](#)). I surmise that the Mutual Exclusivity Principle may have a more profound effect on systems that result from declarative knowledge ('storage'), than on systems produced by rule-based learning ('computation'). In rule-based systems, the linguistic form only results during on-line computation, whereas in storage-based grammars, the form itself is ready-made. Since the Mutual Exclusivity Principle operates on forms, it can only have a very limited effect on forms that are produced by rules, whereas it will affect those forms that are stored in memory.

Given these ingredients let us sketch how the influence of L2-learners on the formation of a creole may lead to a more transparent language, or a 'minimal interface' ([Kihm, 2003](#)). The general reasoning is as follows. Since I assume that L2-learners will rely more on storage of full forms or frames, the mechanisms discussed in Section 2 that allow for mismatches between morpho-phonology and morpho-syntax will not be immediately available to them. Rather, they will be guided by the Mutual Exclusivity Principle which steers them, at least as far as their word-learning is concerned, towards a one-form-one function mapping.

We will have to make a distinction between different types of situations; first we will see what happens in case the learner encounters two forms that differ in some abstract morpho-syntactic property F. Second, we will see what happens in case the learner encounters a single form that is compatible with more than one morpho-syntactic feature.

Suppose that in the L2 there are two morphologically complex forms [[a] b] and [[a] c] that are both frequent enough for the learner to encounter. In order to parse the forms into the parts [a], [b], and [a], [c] respectively, the learner needs to be able a. to recognize the difference in environment in which both forms occur; and b. to associate the formal difference between [b] and [c] with this contextual difference (i.e. set up the relevant correspondence relation). Suppose now that this difference between the two forms is some abstract feature [F] that expresses e.g. gender or case. Such features are considered non-transparent in [Leufkens \(2013\)](#). It may very well be that the L2-learner is unable to access such a feature. That indeed an abstract feature may be difficult to access for some L2-learners is found in e.g. [Blom et al. \(2008\)](#) who show that older L2-learners of Dutch have difficulty in acquiring gender. If such is the case then the difference between [[a] b] and [[a] c] is beyond some learners' capacity and what results for those learners are two forms that express identical semantic content. At that point the Mutual Exclusivity Principle kicks in and these learners will revert to one of the two forms (probably the most frequent one) and simply ignore the other. As a result the morpho-syntactic difference between the two forms disappears and the language becomes more transparent.⁶

Two remarks are in order here. First, note that not just any feature will be beyond the capacity of a late learner of the language. Current research ([Meisel, 2008](#)) seems to suggest that different linguistic properties are related to different critical age periods for acquisition. So, we especially expect effects for those features for which the window of acquisition seems to close early. Second, the effects should be found most prominently in case the 'late' learners revert to storage of complete forms. Only in these circumstances the Mutual Exclusivity Principle can take effect and will drive out one of two competing forms. However, in case the learner acquires something like Verb-second, full storage of whole phrases seems highly unlikely in view of the computational costs, and consequently, the Mutual Exclusivity Principle will take no effect, and non-transparency results.

I believe that there is no reason to make a sharp distinction between inflectional and derivational morphology when it comes to differences between early and late acquisition. From a theoretical point of view such a distinction is questionable given that a framework such as DM does not make a principled distinction between these types of morphology. But also empirically, there are indications that second language learners treat derivational morphology differently from first language learners (see e.g. [Silva and Clahsen \(2008\)](#)). This is also fully in line with work by e.g. De Graff on Haitian Creole ([DeGraff, 2007](#)).

For concreteness sake, consider an L2-learner of Dutch trying to make sense of the opposition between (13a) and (13b), while at the same time (13c) and (13d) also being part of the input:

(13)	a.	het grot-e meisje 'the-neuter big-INFL girl'	b.	een groot meisje 'a big girl'
	c.	de grote-e jongen 'the-common big-INFL boy'	d.	een grot-e jongen a big-INFL boy

⁶ Some evidence for this kind of development may come from the following. In some French-based creoles (e.g. Haitian, Mauritian creole) certain words have the determiner fused to them. In (i) I listed a couple of examples from Haitian:

(i)	lakapital	(>la capitale in French)	'capital'
	lakay	(>la case)	'house'
	lakou	(>la cour)	'yard'
	lapolis	(>la police)	'police'
	legliz	(>l'eglise)	'church'

These nouns have a generic meaning. The crucial observation is that it is not well understood why French-based creoles and not English-based creoles have a small set of nouns with this peculiar property. This would be explainable if the fusion of the determiner is seen as the loss of gender, due to L2-acquisition. Because not all learners will engage in this, we may also have an explanation why this property is limited to a relatively small set of nouns in these French-based creoles (cf. [Aboh, 2015: 70–1](#)). (Thanks to Enoch Aboh for this suggestion).

As one can see in Standard Dutch the adjective is not inflected if the head noun is both neuter and indefinite. However, as [Blom et al. \(2008\)](#) show, the gender property is not easy to acquire by (adult) L2-learners. As a result, they will more or less guess when to use the inflected adjective or the bare form. If we assume that such 'guessing' input would be the basis for the construction of a new language, as could be in the case of a contact language, then the lack of systematic input will give room for the Mutual Exclusivity Principle that will force a single form rather than two in free variation. (This seems what happened in the loss of gender in Afrikaans and Negerhollands, see [Muysken, 2003, 2013](#)). As a result it is no surprise that the inflectional ending will rapidly disappear, resulting in a more transparent system.

More generally, since agreement in whatever form will always result in multiple forms with one and the same referential meaning, combined with the idea that late L2-learners do not easily pick up inflection, this will create a situation in which the Mutual Exclusivity Principle becomes a determining factor. Therefore, the prediction of our reasoning here is that agreement in whatever form will always be a potential victim of creolization.

A different situation may arise in the case of synonymy or contextual spell-out. Let us assume that the morpho-syntactic property being realized in this case is accessible for the L2-learner. For example, nominal plurality may be more easily accessible than case or gender since it has a clear and systematic semantic contribution. To keep matters simple, let us further assume that nominal plurality is expressed by two different affixes *-a* and *-b*. At some point an L2-learner will have found out that *-a* 'means' plurality. The way this is achieved is probably by comparing multiple forms all having a plural meaning and all having the same affix (see e.g. [Pinker, 1984](#) for such learning scenario's). This affix is learned before affix *-b*, probably because of its higher frequency, or it being phonetically more salient. The affix *-b*, expressing the same notion, is now under serious threat. Any attempt to set up a correspondent for *-b* will fail since the correct one, nominal plurality, is excluded because of the Mutual Exclusivity Principle. Therefore, the learner has no room for this affix and the prediction is that it will be lost, again leading to a situation that is more transparent.

6. Concluding on complexity

How alluring the picture of a fully transparent language may be from the perspective of the reverse engineer, I hope to have shown above that this picture is wrong; there is hardly any empirical evidence for such a principle as a first factor of language design. Rather, it seems that mismatches between the levels of morpho-syntax and morpho-phonology are the bread and butter of grammars taking form in processes such as contextual spell-out, fusion, haplology, etc. Such mismatches would be expected to be much less frequent if they were not part of the design of language. It is for these good reasons that models of the interface between syntax and phonology allow for such mismatches and incorporate operations that displace, alter or even delete material before the spell-out takes place.

This shows that from the perspective of the L1-learner 'transparency' cannot be taken as a measure of complexity. L1-learners easily cope with all kinds of mismatches between form and function: to them such mismatches are not a complicating factor. However, what may be simple and straightforward for L1-learners can pose serious difficulties for L2-learners. For the L2-learner languages with many mismatches between form and function will be harder to acquire: we may say that to them such languages are more complex, than languages without such mismatches.

We believe that this difference in perspective may also help to explain the results of the transparency measurements of [Leufkens \(2013\)](#). Since in the formation of creoles we often find a significant role of late L2-learners, a tendency towards more 'transparent' patterns can be expected. More specifically, we have suggested that these learners will be guided by the Mutual Exclusivity Principle which provides a possible, albeit somewhat programmatic, answer to the surprising observation of [Kihm \(2003\)](#), and [Leufkens \(2013\)](#) that creoles seem to have such near transparent lexicon-syntax interface.

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