

**ANIMACY EFFECTS AND LOCATIVE MARKING
IN SHONA APPLICATIVES**

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Abstract

As in other symmetrical languages, the relative order of theme and goal in Shona applicatives is free. However, when the two complements are human, word order freezes inside the VP, with the applied argument realized as the primary object. This paper develops an analysis of this phenomenon in Bidirectional Optimality Theory. It is argued that Object Freezing results from the absence of formal differences between alternative candidates. Additional data from locative marked applied objects provides evidence in favor of the weak version of B-OT, since more marked forms constitute super-optimal pairs with more marked meanings.

“The harder I try the more difficult I find it to say which nominal phrases are syntactic objects in Bantu.”

Thilo C. Schadeberg (1995: 173)

1 Locative applied objects in Bantu

Locative-marked objects are well-documented among the members of the Bantu family (Bresnan 1999). A less noticed phenomenon is the occurrence of locative prefixes on the objects of applied verbs (Marten 2003, Rugemalira 2004), as shown in (1a). In Shona, a symmetrical language (Harford 1993), locative-marked objects can also occur as secondary objects (O2). This is shown in (1b).¹

- (1) a. [Ngoni, Rugemalira 2004:287]
Ag-il-a ku-dasi.
get.lost-APPL-F LOC-wild
'get lost in the wild'

1 I have consulted many of the available descriptive studies of Shona in the preparation of this manuscript, in particular Fortune (1995) and (1980). I am thankful to Mrs. Sandra Mavangira for the time she spent answering my queries about the language and providing me with grammaticality judgments. All errors are my own responsibility. In glossing the examples the following abbreviations are used: 3, third person; 1, first person; APPL, applicative; CAUS, causative; F, final vowel; INST, instrumental; LOC, locative; PASS, passive; PAST, past tense; Pl, plural; Sg, singular.

- b. [Shona]
Murume a-kand-ir-a chimuti ku-imbwa.
 man 3Sg-throw-APPL-F stick LOC-dog
 'the man threw a stick at the dog.'

Locative-marked O2 matter to a theory of applicative constructions because of the way in which they interact with animacy. Hawkins & Hyman (1974) observe the following constraint on Shona ditransitives: When the two complements of a ditransitive verb are human, the applied argument can only be linked to a primary object (O). However, locative marked applied objects are free from this constraint. In this paper, I will argue that a structure with a locative-marked O2 is a marked form that allows the listener to retrieve a marked argument structure. This analysis, in turn, offers evidence for a Bidirectional Optimality-Theoretical approach to argument linking (Blutner 2000, Blutner et al. 2006).

2 Shona as a symmetrical language.

In symmetrical languages, either complement of a ditransitive can be an O (Bresnan & Moshi 1990). Evidence that Shona is symmetrical comes from pronominalization, word order alternations, and passivization.

In an applied construction, the applied argument (i.e. a beneficiary) can be placed immediately after the verb (2a), and it can also be cross-referenced by an object prefix (2b). These are two of the general characteristic properties of primary objects across the Bantu languages. But themes can also have these properties, as the examples in (3a-b) show. In Shona applicative constructions with two complements, then, either complement can display primary object properties at one time. This makes Shona a symmetrical language.

- (2) a. *Nda-vig-ir-a mwana chipo.*
 1Sg.PAST-hide-APPL-F child gift
 'I have hidden the gift for the child.'
- b. *Mwana nda-mu-vig-ir-a chipo.*
 child 1Sg.PAST-3Sg-hide-APPL-F gift
 'The boy, I have hidden the gift for him.'
- (3) a. *Nda-vig-ir-a chipo mwana.*
 1Sg.PAST-hide-APPL-F gift child
 'I have hidden the gift for the boy.'

- b. *Chipo nda-chi-vig-ir-a mwana.*
 gift 1Sg.PAST-3Sg-hide-APPL-F child
 'The gift, I have hidden it for the child.'

According to Lexical Mapping Theory, symmetrical languages arise when the theme and the applied argument can be intrinsically marked [-r]. The [-r] argument, whichever it is, is linked to a primary object, as in (4) and (5).

(4)

Agent	Ben	Theme
[-o]	[-r]	
		[+o]
[-r]	[+r]	
S	S/O	O2
S	O	O2

(5)

Agent	Ben	Theme
[-o]		[-r]
		[+o]
[-r]	[+r]	
S	O2	S/O
S	O2	O

Passivization provides additional evidence that Shona is symmetrical. When a transitive applied verb is passivized, either one of its internal arguments can be realized as the subject, as shown in (6a-b). Moreover, when one of the internal arguments is linked to the subject of the passive, the other one still displays primary object properties, like being able to topicalize and be cross-referenced by an object prefix, as in (6c).

- (6) a. *Chipo cha-vig-ir-w-a mwana.*
 gift 3Sg-hide-APPL-PASS-F boy
 'the gift has been hidden for the boy.'
- b. *Mwana a-ka-vig-ir-w-a chipo.*
 boy 3Sg-PAST-hide-APPL-PASS-F gift
 'the boy has been hidden the gift for.'
- c. *Mwana a-ka-chi-vig-ir-w-a chipo.*
 boy 3Sg-PAST-3Sg-hide-APPL-PASS-F gift
 'the gift, it has been hidden for the boy.'

As in a truly symmetrical language, the two internal arguments of a Shona ditransitive predicate can be intrinsically marked [-r] concurrently.² Because of the Biuniqueness Principle, this only occurs when the agent is suppressed or mapped onto an oblique (Bresnan & Moshi 1990). Thus, when one of the internal arguments is linked to the subject, the other one is linked to the primary object. The linking of the two possible f-structures corresponding to the passive of a ditransitive are shown in (7).

(7)	Agent	Ben	Theme
	--	[-r]	[-r]
		S/O	S/O
	a.	S	O
	b.	O	S

3 The status of locative applicatives

Locative-marked NPs can function as obliques (Obl), as in (8a). These locative arguments can also be realized as applied objects. When they are realized as primary objects, as in (8b), locative applied arguments lose their locative prefix. There is also an alternative construction in which the locative argument retains the locative prefix, and it follows the theme. Interestingly, the verb has the applicative suffix, as shown in (8c). In this sense, the construction in (8c) contrasts with the one on (8a).

- (8) a. *Murume a-kand-a chimuti ku-imbwa.*
 man 3Sg-throw-F stick LOC-dog
 'the man threw a stick towards the dog.'
- b. *Murume a-kand-ir-a imbwa chimuti.*
 man 3Sg-throw-APPL-F dog stick
 'the man threw a stick at the dog.'
- c. *Murume a-kand-ir-a chimuti ku-imbwa.*
 man 3Sg-throw-APPL-F stick LOC-dog
 'the man threw a stick at the dog.'

2 Alsina (1996) makes a distinction between alternating and symmetrical languages. In alternating languages, more than one internal argument can display primary object properties, but only one argument at a time can do so. In symmetrical languages, on the other hand, more than one internal argument can display primary object properties at the same time. Shona is a language of the latter type.

My claim is that the locative-marked NP in (8c) is an O2, not an oblique. As expressed in the quote from Thilo Schadeberg's (1995) paper on Bantu objects, the diagnostics for objecthood are not always decisive. The evidence to distinguish a locative-marked O2 from an Obl is also elusive, but convincing evidence for analyzing the locative argument in (8c) as an object comes from the behavior of locative-marked NPs in causatives. When a monotransitive predicate is expanded with the causative suffix *-is-*, as in (9a), the causee is realized as a primary object. If a causative construction is built on a ditransitive predicate, on the other hand, the causee is realized as an oblique, marked with the instrumental preposition *ne*. This is shown in (9b). The reason for this contrast is quite clear: ditransitives already have two complements, so the causee cannot be mapped onto an objective function when the external instigator takes over the function of sentential subject. If the locative-marked argument of (8c) is a complement, then the clause should behave as a ditransitive when it is expanded with the causative suffix. This is indeed what can be observed. The causee cannot be linked to a primary object (10a), it must be realized as an oblique instead, to avoid 'overcrowding' (10b).

- (9) a. *Mambo a-vak-is-a varume imba.*
 chief 3Sg-build-CAUS-F Pl.man house
 'The chief made the men build a house.'
- b. *Ishe va-vak-is-ir-a mukadzi wavo imba ne*
 chief 3Pl-build-CAUS-APPL-F woman his house INST
varume.
 Pl.man
 'the chief made the men build a house for his wife.'
- (10) a. **Nda-kand-is-ir-a murimi chimuti ku-imbwa.*
 1Sg.PAST-throw-CAUS-APPL-F farmer stick LOC-dog
 'I made the farmer throw a stick at the dog.'
- b. *Nda-kand-is-ir-a chimuti ku-imbwa ne*
 1Sg.PAST-throw-CAUS-APPL-F stick LOC-dog INST
murimi.
 farmer
 'I made the farmer throw a stick at the dog.'

4 Animacy constraints on Shona applicatives

Goals, sources, and other locative arguments, then, can be realized as primary objects or as secondary objects in applicative constructions, as expected in a

symmetrical language. Unlike beneficiaries, however, locative arguments are marked with a locative prefix when they occur as applied secondary objects. There is another difference between applied beneficiaries and applied locative arguments, with respect to animacy. Hawkinson & Hyman (1974) show that when an applicative construction has two human complements, Shona ceases to behave like a symmetrical language: the primary object is always interpreted as the beneficiary, and the secondary object as the theme/patient. This is shown in (11).³

- (11) [Hawkinson & Hyman 1974:151]
Murume a-ka-chek-er-a mukadzi mwana.
 man 3Sg-PAST-cut-APPL-F woman child
 'the man cut the child for the woman.'
 (not: 'the man cut the woman for the child.')

Human locative applied objects can also be realized as primary objects when the theme is human. This is shown in (12a) and (13a). But unlike beneficiaries, human applied goals and sources can be realized as O2s even if the theme is human, as in (12b) and (13b). In these cases, however, the locative marker on the applied object is obligatory.

- (12) a. *Nda-si-ir-a murume mhandara.*
 1Sg-PAST-leave-APPL-F man maiden
 'I have left the maiden to the man.'
 b. *Nda-si-ir-a mhandara ku-murume.*
 1Sg-PAST-leave-APPL-F maiden LOC-man
 'I have left the maiden to the man.'
- (13) a. *Nda-vig-ir-a murume mhandara.*
 1Sg-PAST-hide-APPL-F man maiden
 'I have hidden the maiden from the man.'

3 MChombo & Firmino (1999) report a similar pattern in Gitonga. In fact, animacy effects in ditransitives are not uncommon in the Bantu family. In Runyambo, for instance, human complements precede non-human ones, and animates precede inanimates (Rugemalira 1991). The same constraint is observed in Sesotho (Morolong and Hyman 1977). According to Wald (1994, 1998), postverbal animacy effects of this type are characteristic of the Southern Bantu languages. To the North, animacy effects are observed in the behavior of verbal object markers. Thus, in Swahili, only the complement that is higher in animacy can be cross-referenced by an object marker. Wald notices that Shona displays a transitional pattern of animacy, between North and South.

- b. *Nda-vig-ir-a* *mhandara ku-murume.*
 1Sg-PAST-hide-APPL-F maiden LOC-man
 'I have hidden the maiden from the man.'

Object Freezing occurs in Shona when a sentence is potentially ambiguous, then. Symmetrical mappings are possible when the internal arguments are formally differentiated by means of animacy or locative marking. When the two complements are human and unmarked, the only possible linking ensures that the first argument is interpreted as the beneficiary. In recent years, a bidirectional approach to optimization has been developed to account for such cases of disambiguation (Blutner 2000, Blutner et al. 2006). Bouma (2008), for instance, applies Bidirectional Optimality Theory (B-OT) to explain restrictions on the relative order of subject and object in Dutch. In the following sections, I will develop a B-OT analysis of Object Freezing in Shona. In my analysis, as in many other applications of B-OT, markedness will play a central role. The logic of bidirectional optimization is that marked candidates are not discarded as sub-optimal if they can be interpreted as the expression of a marked input. A B-OT account of disambiguation will then find a way to pair up a marked meaning with a marked form. The OT literature features a number of proposals about animacy effects in syntax based on a sub-hierarchy of markedness constraints (Aissen 1999, 2003, Bresnan...). I will argue that these proposals cannot account for Object Freezing in Shona in their original unidirectional, interpretive optimization framework, but that they provide a useful foundation for the bidirectional analysis I develop here.⁴

5 Bidirectional OT: Basic concepts and refinements

An Optimality-Theoretical grammar (Prince and Smolensky 1993) consists of a ranked set of violable constraints, that evaluate a set of candidate forms for a given input structure. The candidate that incurs the least severe violations of the constraint set is selected as the output. Applications of OT to syntax often reflect a 'productive optimization' bias, assuming that the input is some

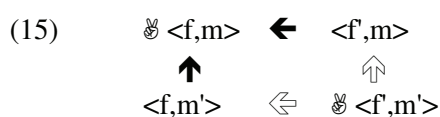
4 I am indebted to Gerlof Bouma for pointing out to me the relevance of chapter 5 of his dissertation for the analysis of word order freezing within OT. Bouma argues there that the strong version of B-OT is sufficient to account for word order freezing in Dutch. In the sections that follow I will argue that the Shona data require the weak version of B-OT. I regret that for reasons of time and space limitations I cannot explore the differences between the two approaches in more depth.

sort of semantic representation, or argument structure, and the output some sort of fully formed syntactic structure. Bidirectional OT complements this kind of productive optimization with an interpretive optimization, in which the input is a syntactic structure and the output a semantic representation. The result of bidirectional optimization is a super-optimal form-meaning pair $\langle f, m \rangle$ that is optimal in either direction. In addition, B-OT (in its weak version) may select some pairs $\langle f', m' \rangle$ as super-optimal even if they are not optimal in any direction. Marked candidates, which normally lose to less marked forms in a uni-directional competition, may then be rescued by the logic of bidirectional optimization as the output for a marked input. This aspect of B-OT makes it a natural framework to formalize analyses of differential argument marking.

In its weak version (Jäger 2002), the definition of a super-optimal pair in B-OT is formulated as follows:

- (14) A form-meaning pair $\langle f, m \rangle$ is called super-optimal if and only if:
- i. there is no distinct super-optimal pair $\langle f', m \rangle$ such that $\langle f', m \rangle > \langle f, m \rangle$, and
 - ii. there is no distinct super-optimal pair $\langle f, m' \rangle$ such that $\langle f, m' \rangle > \langle f, m \rangle$.

The selection of super-optimal candidates is represented in the diagram in (15), in which the arrows point to the more harmonic candidate in a productive optimization (horizontal) or in an interpretive one (vertical). A black arrow indicates that a candidate loses to (or is blocked by) a super-optimal one.



The pair $\langle f, m \rangle$ is super-optimal by virtue of having the most harmonic (i.e. least marked) productive output f and interpretive output m . In a productive optimization that has m as input, for instance, f' will lose to f , so the pair $\langle f', m \rangle$ cannot be super-optimal. In an interpretive optimization that has f' as input, on the other hand, m will outperform m' . But since $\langle f', m \rangle$ is not super-optimal, this leaves $\langle f, m' \rangle$ as the super-optimal pair, according to the definition in (14). The same reasoning applies to $\langle f, m' \rangle$, the other corner of the diagram in (15). In other words, the pair $\langle f, m \rangle$ blocks the pairs $\langle f', m \rangle$

and $\langle f, m' \rangle$, clearing up the field for the more marked pair $\langle f', m' \rangle$.

Because of its representational nature and its parallel architecture, LFG can be advantageously used to formalize the constraints of OT syntax (Bresnan 2000). Kuhn (2003) applies B-OT to LFG, considering correspondences between f-structure and c-structure. I propose to evaluate pairs $\langle f, a \rangle$ of an f-structure f and an a-structure a . I divide markedness constraints in two families: (a) productive constraints, which rule against combinations of f-structure features like grammatical functions, case, etc.; and (b) interpretive constraint, which rule against combinations of a-structure features like semantic roles. Since gender, animacy, and other inherent grammatical features of syntactic constituents are not specified as part of the argument structure of a predicate, constraints on animacy and gender marking (i.e. nominal class prefixes in Bantu) will only be active on the productive side of optimization.

6 A B-OT account of locative OBJ2

In informal terms, my analysis is based on two assumptions: (a) an a-structure with a restricted goal/source is marked,⁵ and (b) an f-structure with a locative object is also marked. Following the OT treatment of Lexical Mapping Theory in Aranovich (2009), mapping constraints are stated in terms of marked associations of the functional features $[\pm r, \pm o]$ with other linguistic features (animacy, thematic roles, etc.). The constraints I propose as part of my analysis of Shona applicatives are stated in (16).

- (16) a. $*[+o]/\text{LOC}$: objective functions are not marked for locative gender.⁶
b. $*[+r]/\text{goal}$: goals (and sources) are not restricted arguments.

5 This assumption is based on the limited distribution of restricted applied objects in East Bantu. According to Wald (1994), West Bantu languages like Umbundu are direct object languages (i.e. they allow for passivization of the theme instead of the beneficiary), while East Bantu languages are innovative in moving towards a primary object pattern, as exemplified by Swahili. In a language like Umbundu, the unmarked option is to assign the feature $[-r]$ to the theme, not to the beneficiary, but in a language like Swahili the markedness values are reversed. Matters are complicated somewhat by the emergence of a symmetrical pattern in Interior Bantu and Southeast Coast Bantu. But even there the unmarked status of the primary object pattern is apparent: in Central Chewa, the theme can passivize with instrumental applied objects, but not with beneficiary applied objects.

6 LOC refers to locative gender as an f-structure feature, not to a locative role in argument structure.

Tableaux 1 and 2 show how one of the super-optimal pairs is selected. This is the pair linking the unmarked a-structure to the unmarked f-structure. In this way, applied goals are encoded as primary objects (without locative marking), and these in turn are interpreted as goals.

TABLEAU 1a: productive optimization

a: V <ag, goal[-r], th[+r]>	*[+o]/LOC
☞ ☞ f: S, O, O2	
f: S, O, Loc-O2	*!

TABLEAU 1b: interpretive optimization

f: S, O, O2	*[+r]/goal
☞ ☞ a: V <ag, goal[-r], th[+r]>	
a':V <ag, th[-r], goal[+r]>	*!

In addition, bidirectional optimization links the marked a-structure with the marked f-structure (i.e. it encodes a [+r] goal/source as a locative-marked O2). The following tableaux show the selection of the disharmonic candidates as super-optimal (the optimal candidates are indicated with ☞, the dark pointing hand). These are not super-optimal candidates, however, being blocked by the winning ones in tableaux 1 and 2. For instance, the pair <f,a'>, which is the most harmonic one in tableau 2a, is blocked by <f,a> in tableau 1b. Since there is no competition in which <f',a'> is less harmonic than another super-optimal pair, <f',a'> is itself super-optimal.

TABLEAU 2a: productive optimization

a': V <ag, th[-r], goal[+r]>	*[+o]/LOC
☞ f: S, O, O2	
☞ f: S, O, Loc-O2	*!

TABLEAU 2b: interpretive optimization

f': S, O, Loc-O2	*[+r]/goal
☞ a: V <ag, goal[-r], th[+r]>	
☞ a':V <ag, th[-r], goal[+r]>	*!

7 A B-OT account of beneficiary applied objects

The set of productive and interpretive competitions discussed in the previous section insure that when a locative argument (goal or source) is realized as an O it does not bear a locative marker, but that this locative marker is retained when the locative argument is realized as an O2. This accounts, for instance for the alternation between (12a) and (12b), and also between (13a) and (13b). Unlike locative arguments, beneficiaries are never marked with locative prefixes, not even as O2.⁷ Locative marking, then, cannot formally distinguish an applicative structure with a beneficiary O from a structure with a beneficiary O2. With two human complements, the interpretation neutralizes to the unmarked argument structure in which O is always interpreted as the beneficiary, resulting in Object Freezing. At this point, an attentive reader may ask how it is possible for a beneficiary to ever be realized as an O2, even when the theme is not human. What I argue in this section is that the inanimate feature of the theme helps to disambiguate the structure, forcing the interpretation of the human argument as a beneficiary, even when it is an O2.

(In)animacy, like locative marking, provides the marked formal features that allows the listener to retrieve the marked argument structure. In informal terms, f-structures with inanimate unrestricted arguments are marked, and can be linked to a marked a-structure with a [+r] beneficiary in a bidirectional optimization. To account for the markedness of these structures, I propose the additional constraints in (17).

- (17) a. *[-r]/Inan(imate): Unrestricted functions are not assigned to NPs with inanimate features.⁸
b. *[+r]/ben: Beneficiaries are not restricted.⁹

7 In fact, because they cannot have locative prefixes, beneficiaries can only be realized as applied objects, never as obliques.

8 The motivation for this constraint is discussed in more detail in section 9. Notice that [-r] functions include S and the primary object O, so this constraint is not qualifying an inanimate O as more marked than an S. Rather, it ensures that an inanimate O is paradigmatically more marked than an inanimate O2. Notice, too, that this constraint does not state that the feature [-r] is marked, only that its association with an NP with inanimate features is marked.

9 A reviewer remarks that beneficiaries, because of the nature of their semantics, are restricted. However, in primary object languages, beneficiaries are assigned to [-r] functions, not themes. This is because when there is more than one internal argument the one that is unrestricted is the one that ranks higher in the thematic hierarchy, the beneficiary in this case.

The following tableaux show the selection of a super-optimal pair that matches a marked a-structure with a restricted applied beneficiary (*a'*) and a marked f-structure in which the O is inanimate (*f'*).

TABLEAU 3a: productive optimization

a': V <ag, th[-r], ben[+r]>	*[-r]/Inan
☛ f: S, O, O2 _[inan]	
☞ f: S, O _[inan] , O2	*!

TABLEAU 3b: interpretive optimization

f: S, O _[inan] , O2	*[+r]/ben
☛ a: V <ag, ben[-r], th[+r]>	
☞ a': V <ag, th[-r], ben[+r]>	*!

The bidirectional optimization in tableaux (3a) and (3b), then, accounts for the contrast between examples like (2a) and (3a), in which an inanimate theme can be realized as either an O2 or as an O. The beneficiary can be realized as an O2 in (3a) without any additional marking, since animacy distinguishes it from the theme. When both the beneficiary and the theme are human, on the other hand, there are not two formally distinct f-structures that can enter the competition, but there are two distinct a-structures. The competition for super-optimal status is confined to two pairs, then: the unmarked <*f,a*>, and the less harmonic <*f,a'*>. Since <*f,a*> is already super-optimal, it blocks <*f,a'*>. This is shown in tableau 4.

TABLEAU 4: interpretive optimization

f: S, O _[hum] , O2 _[hum]	*[+r]/ben
☛ ☞ a: V <ag, ben[-r], th[+r]>	
a': V <ag, th[-r], ben[+r]>	*!

A clause with an applied human beneficiary and a human theme, then, has only one possible interpretation, one in which the beneficiary is the O and the theme is the O2. The contrast between an a-structure with a [-r] beneficiary and an a-structure with a [+r] beneficiary is neutralized in favor of the former, since there is no formal means to express the distinction. This is the

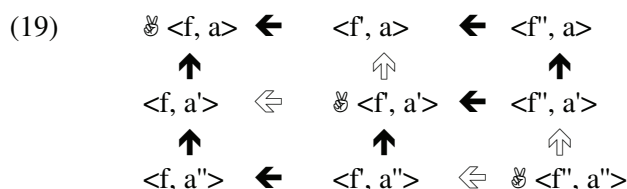
desired result, given the observations about sentences like (11).

8 Locative marking in applied constructions with inanimate themes

The last case to consider is probably the hardest. It involves sentences (8b) and (8c), repeated below as (18a-b), with the goal in boldface. Since the theme is inanimate, and therefore distinct from a human goal, the locative marking on the goal seems redundant when the goal is an O2.

- (18) a. *Murume akand-ir-a* ***imbwa chimuti.***
 man 3Sg-throw-APPL-F dog stick
 'the man threw a stick at the dog.'
- b. *Murume a-kand-ir-a* *chimuti ku-imbwa*
 man 3Sg-throw-APPL-F stick LOC-dog
 'the man threw a stick at the dog.'

The observation that explains the presence of the locative prefix in (18b) is that (18b) also competes against sentences in which the O2 is a morphologically unmarked applied argument, i.e. a beneficiary. The logic of multiple-way competitions in B-OT is such that the more marked the form, the more marked the meaning it is going to be paired with. Once a super-optimal pair is identified, any less harmonic pair with which it competes is blocked. This is illustrated in the following diagram:



An f-structure with an inanimate O and a locative marked O2 is the most marked. A bidirectional optimization will pair it up with the most marked a-structure. For this to be the case, a restricted locative applied argument must be more marked than a restricted beneficiary. This is achieved by ordering the markedness constraints I have introduced in (16b) and (17b) in the following way:

- (20) * [+r]/goal >> * [+r]/ben

As shown in Tableau 5a, the f-structure *f* is the most harmonic one, but it

cannot make a super-optimal pair with the a-structure a'' because f is interpreted as the expression of the unmarked argument structure a (i.e. the a-structure in which the goal is [-r]). The next f-structure in the harmonic ranking is f' , but the pair $\langle f', a'' \rangle$ is blocked by another super-optimal pair, $\langle f', a' \rangle$ (where a' is the a-structure that has a beneficiary marked as [+r]). This kind of blocking is indicated here by the ✖ mark. This leaves f'' as the only viable candidate to form a super-optimal pair with a'' . A similar reasoning applies to the interpretive optimization in tableau 5b. Even though a is the unmarked interpretation, it cannot form a super-optimal pair with f'' because the pair $\langle f, a \rangle$ blocks it. The next most harmonic a-structure a' has an restricted beneficiary, but this is the super-optimal interpretation for an f-structure f' , with an O2 that has no locative prefix. The pair $\langle f', a' \rangle$, then, blocks the pair $\langle f'', a' \rangle$. The only expression for f'' that is not blocked by another super-optimal pair is a'' .

TABLEAU 5a: productive optimization

a'' : V <ag, th[-r], goal[+r]>	*[+o]/LOC	*[-r]/Inan
☛ f: S, O, O2 _{inan}		
✖ f: S, O _{inan} , O2		*!
☞ f'': S, O _{inan} , Loc-O2	*!	*

TABLEAU 5b: interpretive optimization

f'' : S, O _[inan] , Loc-O2	[+r]/goal	*[+r]/ben
☛ a: V <ag, goal[-r], th[+r]>		
✖ a': V <ag, th[-r], ben[+r]>		*!
☞ a'': V <ag, th[-r], goal[+r]>	*!	

Even in symmetrical languages, then, one of the ditransitive structures is marked. In Shona, locative gender and animacy are clues that make it possible for the listener to assign the marked interpretation to a ditransitive applicative. When these surface clues are absent, only the unmarked interpretation is available to the listener.

9 B-OT and the 'harmonic alignment' analysis compared

The bidirectional model of Object Freezing in Shona builds on earlier OT approaches to animacy. Aissen (1999, 2003) uses harmonic alignment to

model the implicational effects of person-animacy scales on voice alternations and differential object marking. In this approach, a person-animacy scale like the one in (21a) is aligned with the binary scale of grammatical functions in (21b), yielding the constraint sub-hierarchies in (22)

- (21) a. 1st, 2nd > 3rd > Hum(an) > Anim(ate) > Inan(imate)
 b. S(ubject) > O(bject)
- (22) a. *S/Inan >> *S/Anim >> *S/Hum >> *S/3rd >> *S/1st, *S/2nd
 b. *O/1st, 2nd >> *O/3rd >> *O/Hum >> *O/Anim >> *O/Inan

The effect of these constraint sub-hierarchies is that pronominal objects are more marked than human objects, human objects are more marked than non-human objects, and so on. For subjects, the markedness relations are inverted. When a patient is human, then, the grammar of a particular language may prefer to link it to a subject (as in a passive construction, for instance), or else to realize the patient as a morphologically marked object, as it happens in Spanish and other Romance languages.

It is not difficult to conceive an extension to ditransitives of Aissen's work on animacy effects on transitives, assuming the binary scale $O > O_2$ of grammatical functions. This analysis predicts that a sentence in which the patient is mapped to a more prominent function than the goal (i.e. the O) is marked.¹⁰ This is what happens, for instance, in the English prepositional dative. The marked structure is preferred, however, when the unmarked competitor (i.e. the English double object construction) would have a low-ranked function (an O_2) with more prominent animacy features. This is precisely what Bresnan et al. (2005) conclude in their study of the occurrence of ditransitives in the Switchboard corpus of spoken English. They found that, among other factors, pronominal complements tend to precede nominal complements, and animate complements tend to precede inanimate complements. Thus, a prepositional dative sentence like (23a) would be more likely to occur than a double object sentence like (23b).¹¹

10 In addition, prepositional dative sentences are more marked than double object sentences because of the additional structural complexity contributed by the prepositional phrase (i.e. they violate *STRUC, the same constraint penalizing passives).

11 This study is a follow-up to Bresnan et al. (2001), who argue that the effects of the constraint sub-hierarchies proposed by Aissen are also observed in patterns of syntactic variation. They analyze the occurrence of passive in the Switchboard corpus to find that the ratio of active to passive is the smallest for clauses in which the patient outranks the agent in person features.

- (23) a. give it to the child
 b. %give the child it

One way to account for this kind of animacy effects on ditransitives is to harmonically align the person-animacy scale in (21a) with the binary scale $O > O_2$, yielding the constraint sub-hierarchies in (24). The constraint sub-hierarchy in (24b) has the effect of penalizing those candidates whose secondary objects rank higher in the scale of person-animacy.

- (24) a. *O/Inan >> *O/Anim >> *O/Hum >> *O/3rd >> *O/1st, *O/2nd
 b. *O2/1st, 2nd >> *O2/3rd >> *O2/Hum >> *O2/Anim >>
 *O2/Inan

This extension of Aissen's harmonic alignment approach to ditransitives has to be amended, however, because of two shortcomings. The first one is of a general nature, and it can be solved by harmonically aligning semantic roles and animacy features with the functional features $[\pm o]$ and $[\pm r]$. The second one arises when the unidirectional, productive-oriented optimization implied in Aissen's model is applied to Object Freezing in Shona. This, too, can be solved, by adopting the bidirectional approach I have developed in the preceding sections.

The first shortcoming is that the sub-hierarchy in (24a) seems to contradict the hierarchy previously discussed in (22b): it favors candidates whose primary objects rank higher on the animacy scale. One possible solution to this problem is to replace the grammatical functions in the constraints in (22) and (24) by their distinctive functional features, $[\pm o]$ and $[\pm r]$ respectively. The sub-hierarchies in (24) are then replaced by the ones in (25).

- (25) a. *[-r]/Inan >> *[-r]/Anim >> *[-r]/Hum >> *[-r]/3rd >> *[-r]/1st,
 *[-r]/2nd
 b. *[+r]/1st, 2nd >> *[+r]/3rd >> *[+r]/Hum >> *[+r]/Anim >>
 *[+r]/Inan

According to this model, animacy features high in the hierarchy are unmarked for $[-o]$ and $[-r]$ functions. Notice that the constraint *[-r]/Inan, introduced in (17a), now finds its place among the constraints in the sub-hierarchy (25a).

The second shortcoming concerns the unidirectional application of

these constraints to Object Freezing in Shona. The animacy effects on Shona ditransitives discussed in Hawkins and Hyman (1974), which are the focus of my paper, are often cited as the categorical counterpart to the English preference for clauses in which the first complement outranks the second in animacy. However, on close examination, the harmonic alignment model of animacy effects cannot be straightforwardly applied to Object Freezing in Shona. A markedness sub-hierarchy of alignment constraints determines the outcome of optimization only when the candidates have arguments that differ in animacy. Object Freezing represents the opposite situation. When the two complements are [+human], only one argument mapping is possible: the O can only be a goal, not a theme. An alignment constraint of the form *O2/Hum (or *[+r]/Hum) cannot decide between a candidate in which the O2 is the goal (or beneficiary), and a competitor in which the O2 is a theme. Conversely, if the candidates' complements have different animacy features, a markedness constraint should rule out one in favor of the other. But this is the case in which either candidate is a possible output: when the theme is [-animate], it can be mapped onto an O or onto an O2.

For the harmonic alignment approach to Object Freezing in Shona to succeed both directions of optimization have to be taken into account. The central hypothesis in this analysis is that marked f-structures have an O2 that outranks the O in a scale of animacy.¹² Due to the logic of bidirectional optimization, the marked f-structures are not discarded. Instead, they are recycled as the expression of a marked a-structure. Object Freezing occurs when there is no competing, more marked f-structure that can be interpreted as the expression of a marked a-structure. This occurs when the overt resources of the grammar, in terms of animacy features or morphological marking, are too poor to mark two alternative structures as formally distinct. Object Freezing in Shona, then, offers a compelling argument in favor of bidirectional optimization. It also offers indirect but convincing evidence that the same soft constraints that are at work in English have a categorical effect in other languages.

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¹² There are applicative constructions in some other Bantu languages, however, which seem to behave according to the unidirectional, productive model of optimization (cf. footnote 2). It is open to future research how to integrate these languages in the bidirectional model I am proposing for Shona.

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