Transparent, restricted and opaque affix orders

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1. Introduction*

Cross-linguistic research on the morphological structure of words has revealed two tendencies for possible affix orders: whereas functional categories (e.g. tense-aspect-mood systems) show a strong tendency for fixed affix orders (see Bybee 1985 and Wunderlich 1993), which only exhibit a small range of cross-linguistic variation, adverbial affixes and diathesis markers surface in variable orders that correlate with systematic differences in meaning. The behavior of both classes of morphemes can be motivated semantically; the current literature on affix order, though, is mainly dominated by syntactic approaches (e.g. Baker 1985, Pesetsky 1985, Muysken 1986, Speas 1991, Alsina 1999).

The research on affix order has been stimulated by Baker's (1985) *Mirror Principle*, which states that affix orders should mirror syntactic derivations:

(1) *Mirror Principle* (Baker 1985:375)
Morphological derivations must directly reflect syntactic derivations (and vice versa).

Whereas in the original paper, Baker's proposals concerning the nature of the relevant operations are quite vague, Baker (1988) proposes a system where the affix order results from underlying syntactic configurations by head movement. In most cases, a given affix order can only receive a unique interpretation. Gaps in potential affix orders result from violations of syntactic principles (e.g. *Case Filter*, *Empty Category Principle*).

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Muysken (1986) interprets the *Mirror Principle* in terms of scope: if an affix A has scope over affix B, it must be external with respect to B, which may be illustrated as follows:

(2) a. Affix order: V-AFF$_1$-AFF$_2$-... vs. V-AFF$_2$-AFF$_1$-...
b. Semantic scope: AFF$_2$(AFF$_1$(V)) vs. AFF$_1$(AFF$_2$(V))

The representations in (2) are meant to also include the mirror image, where all affixes are realized as prefixes.

In case where the relevant affixes do not attach at the same side of the verbal stem, affix orders by themselves normally do not indicate their order of application. Therefore, the following structures are possible:

(3) [AFF$_1$-[Verb-AFF$_2$]] vs. [[AFF$_1$-Verb]-AFF$_2$]

However, in some languages, such affix orders can be distinguished due to structural properties (e.g. linking patterns such as case distributions) or due to certain allomorphies. I will provide evidence for this in the following sections.

A recent proposal by Rice (2000) puts emphasis on the availability of affix combinations that may receive different scope readings. According to Rice, three cases of affix combination have to be distinguished: first, two affixes A and B do not exhibit a scope relation; therefore, no affix order concerning A and B is preferred. Both affix orders may be possible, or a language may arbitrarily choose one option. The combination of the Chichewa (Bantu) intensifier (INT) *-its* 'do V well, intensively' with various diathesis markers is a case in question:

(4) Position of the intensifier morpheme in Chichewa
(Hyman and Mchombo 1992)
a. V-INT-APPL *V-APPL-INT
b. V-INT-PASS *V-PASS-INT
c. V-REC-INT V-INT-REC

With the applicative (APPL) *–Ir* and the passive (PASS) *–Idw*, the intensifier may only occur as inner morpheme; thus, the affix order is arbitrarily fixed. However, with the reciprocal (REC) *–an*, it may show up in both orders, yielding no interpretational difference.

Secondly, each of the two affixes may take the other one into its scope. Therefore, both affix orders are relevant because they differ in their scopal interpretations. Thirdly, the scope relation is fixed such that only affix A may take affix B into its scope; thus, only the order with A being the outer morpheme is possible. The first two cases are instances of local variability, i.e., there may be language-internal or cross-linguistic variation regarding the actual affix orders, whereas the third case is predicted to show global uniformity, i.e., all languages should display the relevant affix order. The second case is the one I am most interested in: the availability of two affix orders. The notion of scope, proposed by Muysken and Rice, will be clarified by considering explicit semantic representations.

Differences in affix orders may result from semantic or syntactic properties. If, for instance, a causative affix (CAUSE) is combined with an adverbial affix (MOD), the readings in (5a/b) obtain: In (5a) the (outer) adverbial affix modifies the complex situation of causation, whereas in (5b), it only modifies the subevent expressed by the base verb.[1] (5c-e) show the simplified representations for a transitive base verb, the verb extended by an adverbial affix and the causativized variant of the verb. Following the tradition of *Lexical Decomposition Grammar* (Joppen and Wunderlich 1995, Wunderlich 1997b, Stiebels 1999), I represent the argument structure of a lexical item as a sequence of λ-abstractors (abstracting over the argument variables in Semantic Form [SF]): the referential argument of the verb, i.e. the situational variable s, is considered to be the highest argument and written as right-most argument on the theta-grid. The other arguments are written to its left according to their depth of embedding in SF and, thus, to their rank on the argument hierarchy.

(5) Combination of causative and adverbial morpheme
   a. V-CAUSE-MOD
      λy λx λu λs' ∃s [[ACT(u) & V(x,y)(s)](s') & MOD(s')]
   b. V-MOD-CAUSE
      λy λx λu λs' ∃s [ACT(u) & [V(x,y)(s) & MOD(s)]](s')
   c. V λy λx λs V(x,y)(s)
   d. V-MOD λy λx λs [V(x,y)(s) & MOD(s)]
   e. V-CAUSE λy λx λu λs' ∃s [ACT(u) & V(x,y)(s)](s')

Structural differences of affix orders often depend on the accessibility of arguments. Certain adverbial affixes, for instance, if combined with an applicative, may access the applied argument only as the outer morpheme. Wechsler (1989) has shown that adverbial affixes such as 'again' can only take direct arguments into their scope, which requires the applicative to apply before the affixation of the adverbial morpheme. In the following examples from Chichewa, the clitic *nso* 'again' can take the instrumental phrase into its scope only if the latter has been integrated as structural argument via applicativization as in (6b); in (6a), the instrumental phrase is realized as oblique adjunct.

(6) Repetitive in Chichewa (Wechsler 1989:429)
   a. *mu-lembe=**nso*** *chimangirizo* *ndi* *nthenga*
      2SG-write=again essay with feather
      'you write the essay again, with a quill (this time)'
   b. *mu-lembe-**re**=**nso*** *nthenga* *chimangirizo*
      2SG-write-APPL=again feather essay
      'you write the essay with a quill again'

It is the goal of this paper to provide a programmatic and semantically based overview of possible affix orders within the domain of diathesis morphology: which diathesis markers may be combined in principle and to which extent is the resulting morphological structure compositional, i.e. reflects the semantic composition and structural generation of forms? I will show that Baker (1988) makes wrong

claims concerning possible diathesis combinations and that the *Mirror Principle* is a violable constraint.

In the following section, I will discuss the compositionality of affix orders and introduce the notion of transparent, restricted and opaque affix orders. Section 3 briefly presents Baker's (1988) predictions for possible diathesis combinations and my analysis of diathesis operations. Section 4 is concerned with diathesis combinations that yield an identical semantic output, whereas section 5 is concerned with those that differ in semantic terms. Section 6 finally treats diathesis combinations in which one of the possible orders subsumes the inverse one.

2. Compositionality of affix orders

Given that a particular combination of two morphemes A and B has the universal potential for free order of application, and, hence, for the two affix orders A-B and B-A, one must distinguish three subcases with respect to the resulting structures: The most unproblematic case is the one in which both affix orders occur and transparently reflect the underlying scope relations. I will call these cases *transparent affix orders*. The following example from Bolivian Quechua shows the transparency of the combination of hortative and assistive. The assistive adds an assister argument to the base verb, which is realized as subject. The hortative, some kind of intensifier, expresses that the action denoted by the verb is executed with a certain amount of energy.

(7) Assistive/hortative in Quechua (van de Kerke 1996:198)
   a. *p'acha-ta t'aqsa-**ysi-rqu**-wa-rqa*
      cloth-ACC wash-ASS-HORT-1.A-3SG.PAST
      'she helped me wash the clothes energetically'
   b. *p'acha-ta t'aqsa-**rqu-ysi**-wa-rqa*
      cloth-ACC wash-HORT-ASS-1.A-3SG.PAST
      'she helped me energetically wash the clothes'

(7a) has the expected interpretation that the assisting action is executed energetically, whereas (7b) denotes the situation of energetic washing.

If due to a language-specific constraint, only one affix order occurs, which receives a surface-true, i.e. compositional interpretation, this affix combination is *restricted*. Quechua, for instance, allows the repetitive affix *–kipa* 'again' only to be internal to the causative affix. The inverse order is not possible. The interpretation is compositionally fixed to the repetition of the situation expressed by the base verb.

(8) Causative/repetitive in Quechua (van de Kerke 1996:176)
*mama-y p'acha-ta t'aqsa-**kipa-chi**-wa-rqa*
mother-1SG.P cloth-ACC wash-REP-CAUSE-1.A-3SG.PAST
'my mother made me rewash the clothes'
#'again my mother made me wash the clothes'

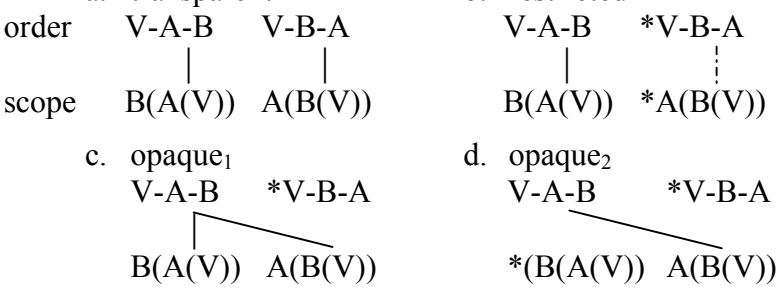
The most problematic case regarding the realization of a particular morpheme combination is found in languages in which a given affix order has both the compositional and the non-compositional interpretation. The latter violates the *Mirror Principle*. These affix orders are *opaque*. Whereas restricted affix orders show a complete gap for a certain morpheme combination, opaque affix orders only lack a distinct PF for one of the two readings. The combination of hortative and causative in Quechua is an example for an opaque affix order: the surface order HORT-CAUSE has the additional non-compositional interpretation that the causing event is executed energetically.

(9) Hortative/causative in Quechua (van de Kerke 1996:177)
*Maria-wan p'acha-ta t'aqsa-**rqu-chi**-na-yki tiya-n*
Maria-COM cloth-ACC wash-HORT-CAUSE-NOML-2SG be-3SG
a. 'you should make Maria wash the clothes with energy'
b. 'you must energetically make Maria wash the clothes'

An even stronger case of opacity occurs if only one of the potential affix orders is allowed and if this has the interpretation of the inverse

affix order, hence violates the *Mirror Principle*. This case is illustrated in (10d): the first line shows the morphological orders (with V being the verbal stem), the second line the underlying scopal relations.

(10) Schema of attested affix orders in multiscopal contexts



These few examples from Quechua have already illustrated that a language may display transparent, restricted and opaque affix orders within the same domain of morphology, and that some affixes may even surface in both transparent and opaque affix orders (e.g. the hortative).

One may speculate that different types of constraints are responsible for non-transparent affix orders: restricted affix orders presumably result from semantic and syntactic constraints, whereas opaque affix orders result from phonological and morphological surface constraints that dominate a constraint such as the *Mirror Principle*, or have to be explained in terms of language-specific conditions on grammaticalization.

3. Order of diathesis markers

The most elaborate proposal concerning possible diathesis combinations has been made by Baker (1988). He analyzes diathesis markers as affixal heads that need to be incorporated into a governing head. Baker distinguishes three types of complex incorporation: whereas cyclic incorporation involves consistent movement of affixal heads

into governing heads, acyclic incorporation means that an intermediate head is skipped and incorporated separately. Separate incorporation consists of parallel head movement of the heads of sister categories into the governing head. Acyclic incorporation is excluded in principle by the *Empty Category Principle*. Among the diathesis combinations that are based on cyclic or separate incorporation, some are excluded by the *Stray Affix Filter* (affixes should be attached to a stem) and the *Case Filter*. According to this analysis, the possible diathesis combinations should pattern as follows:

(11) Possible diathesis combinations according to Baker (1988)

Diathesis markers	derivation	affix order
CAUSE/ANTIPASS	cyclic	ANTIPASS-CAUSE
	acyclic	*CAUSE-ANTIPASS
CAUSE/APPL	separate	CAUSE-APPL
	separate	*APPL-CAUSE
CAUSE/PASS	cyclic	CAUSE-PASS (type1/2)
	cyclic	PASS-CAUSE (type 2)
ANTIPASS/APPL	separate	*ANTIPASS-APPL
	acyclic	*APPL-ANTIPASS
APPL/PASS	cyclic	APPL-PASS
	acyclic	*PASS-APPL

According to Baker, only causative and passive may be combined in both orders – at least in type 2 languages, whereas in type 1 languages, PASS-CAUSE violates the *Stray Affix Filter*. ANTIPASS-APPL and APPL-CAUSE violate the *Case Filter* under Baker's assumptions. Moreover, antipassive and applicative should not combine in any case. However, as cross-linguistic studies reveal, Baker's approach is far too restrictive. I will provide the relevant counter-evidence in the following sections.

Within the framework I would like to propose, all diathesis markers can be combined in principle in both orders but may be restricted due to language-specific constraints on linking, i.e. the morphosyn-

tactic realization of arguments. I assume that the *Mirror Principle* should be formulated in semantic terms (see also Muysken 1986):

(12) *Mirror Principle* (own version)
'The affix order must mirror semantic composition.'

This version of the *Mirror Principle* requires that the order of semantic integration of morphemes corresponds to their position in morphological structure, i.e. their relative distance to the stem. Unlike Baker, I assume that the *Mirror Principle* is a violable constraint: opaque affix orders violate it due to some higher-ranked constraint.

In the following I will discuss to what extent the various combinations of diathesis markers yield affix orders that need to be distinguished in syntactic or semantic terms and to what extent transparent, restricted, and opaque affix orders occur.

Following Wunderlich (1997b) and Dixon and Aikhenvald (2000) I distinguish three types of diathesis: (a) argument extension such as causative, assistive or applicative, (b) argument reduction as found with agentless passive, 'patientless' antipassive and reflexivization, and (c) diatheses that bring about alternative argument realizations such as agentive passive, antipassive with oblique realization of the internal argument, dative shift and locative alternation. I will not consider dative shift and locative alternation in the following.

The representation of the causative has already been given in footnote 1. The assistive also introduces a highest argument but must be represented as an object control verb: it takes a verbal predicate, adds an assister argument and identifies the 'assisted' with the highest argument of the base verb; since there is no evidence in van de Kerke's data that these verbs may express indirect assistence, I do not assume that a new situational variable is introduced:

(13) Representation of assistive (Quechua)
ASS $\lambda P\, \lambda x\, \lambda u\, \lambda s$ ASSIST$(u,x,P(x))(s)$

In contrast to causative and assistive, the applicative introduces a lowest (or second-to-lowest) argument, namely the applied argument,

which is realized as direct object. The following example from the Bantu language Kinyarwanda shows a benefactive applicative, in which a beneficiary ('boy') is added.

(14) Applicative in Kinyarwanda (Kimenyi 1980:32)
umukoôbwa *a-ra-som-**er**-a* *umuhuûngu* *igitabo*
girl 3SG.N-PRES-read-APPL-ASP boy book
'the girl is reading a book for the boy'

The argument extension found in the applicative is triggered by the integration of a semantic predicate, which I will simplify as APP(s,u), a place-holder for more specific predicates that integrate a beneficiary, instrument and so on (see (15a)). The applicative cannot be represented as a functor on verbs because this would yield inconsistencies between the argument hierarchy predicted from the process of semantic composition via Functional Composition and the arguments' depth of embedding in SF (Stiebels 1996, Wunderlich 1997a). I assume that the base verb undergoes argument extension as in (15b), i.e. it is extended by a predicative argument, and that the applicative is integrated via Functional Composition as shown in (15c) so that the arguments of the applicative are inherited to the base verb.

(15) Representation and derivation of applicative
a. APPL λu λs APP(s,u)
with APP ∈ {INSTR(s,z), LOC(s,z), POSS(u,v), ...}
b. V λy λx λs VERB(x,y)(s)
→ λP λy λx λs [VERB(x,y)(s) & P(s)]
c. V-APPL λz λy λx λs [VERB(x,y)(s) & APP(s,z)]

I assume that the agentless passive is represented as a functor that existentially binds the highest argument of the base verb (see (16a)). With agentive passive, the highest argument is marked as oblique (see (16b)).

(16) Representation of passive
a. λP λs ∃x P(x)(s) [agentless passive]
b. λP λx λs P(x)(s) [agentive passive]
+obl

Antipassive functions as the mirror image of passive. It either existentially binds the lowest argument of the base verb as shown in (17a) for a transitive verb, or marks this argument as oblique as in (17b).

(17) Representation of antipassive
a. λP λx λs ∃y P(x,y)(s) [patientless antipassive]
b. λP λy λx λs P(x,y)(s) [oblique antipassive]
+obl

Finally, reflexivization involves either co-indexation of θ-roles if it takes place in syntax (see (18a)), or multiple λ-abstraction if it is encoded morphologically (see (18b)).[2]

(18) Representation of reflexivization (transitive base verb)
a. $\lambda y_i \lambda x_i$ λs V(x,y)(s) [syntax]
b. λx V(x,x)(s) [morphology]

In this paper, I am concerned with morphological reflexives/reciprocals.

The various combinations of diathesis markers show a varying tendency toward transparent, restricted and opaque affix orders, as I will show in the following. In principle, combinations of diathesis markers may be restricted due to semantic/conceptual factors (e.g. the role of specified agent arguments, the potential ambiguity of forms) and structural factors such as the maximal number of structural linkers and structural arguments in the particular language, the linker inventory, the symmetry or asymmetry of objects (Bresnan and Moshi 1993) and the obligatoriness of morphological marking of argument saturation (e.g. by means of pronoun or noun incorporation); these parameters constitute the linking profile of the language.

Recall that languages with symmetric objects allow both internal arguments to be alternatively realized as the subject of a passive verb – besides other symmetries. Further restrictions are attested: in many languages, diathesis operations that follow argument extensions must not affect the structural realization of arguments that have been introduced into the base verb, whereas diathesis operations that follow argument reductions may be affected by the lack of structurally accessible arguments.

In the following, I will first discuss diathesis combinations that yield an identical semantic output; then I will discuss those combinations that differ in their semantic output. Finally I will show to what extent affix orders may be in a subsumption relation. Apart from one exception (see section 5.1), all diathesis combinations are affected by the language-specific linking profile and thus expected to show cross-linguistic variation (see also Alsina 1999).

4. Diathesis combinations with identical semantic output

Diathesis combinations that have an identical semantic output, i.e. have an identical SF, may still differ in their θ-grid. Therefore I will distinguish two cases: diathesis combinations with identical SF and identical θ-grid and diathesis combinations with identical SF but distinct θ-grid. Only the first type is predicted to be either realized by a single affix order or to show free variation.

4.1 Diathesis combinations with identical θ-grid

A diathesis combination that yields an identical output both for SF and θ-grid in any order is the combination of passive and reflexive, as shown for a transitive base verb:

(19) Combination of passive and reflexive (transitive base verb)
   a. V-PASS-REFL $\lambda y\, \lambda s\, \exists x\, V(x,y)(s) \rightarrow \lambda s\, \exists x\, V(x,x)(s)$
   b. V-REFL-PASS $\lambda x\, \lambda s\, V(x,x)(s) \rightarrow \lambda s\, \exists x\, V(x,x)(s)$

As with all similar cases, the two affix orders differ, however, in their intermediate step. In (19a) the possible antecedent of the reflexive is bound prior to reflexivization, whereas in (19b) it is bound after reflexivization, which might lead to a slight preference for (19b). Alsina (1999) claims that (19a) is universally excluded. The order V-PASS-REFL could be impossible in languages that require antecedents to be structurally realized. In principle, both combinations of passive and reflexive are ungrammatical with 2-place verbs in languages that do not allow impersonal passives. Moreover, with 3- and 4-place verbs, V-REFL-PASS is only possible in languages with symmetric objects (Alsina 1999) because only then can one of the remaining internal arguments be promoted to subject position.

In Classical Nahuatl, an Uto-Aztecan language, the order of passivization and reflexivization can be determined on the basis of the actual reflexive allomorphs. In general, a 'specific reflexive' (with person and number agreement) is used if the argument in question is bound by the highest argument as in (20a). If the antecedent is not realized structurally as highest argument, the 'unspecific' reflexive *ne-* is used as in (20b): here, the highest argument is existentially bound and thus not accessible.

(20) Passive/reflexive in Classical Nahuatl (Launey 1979:61)
  a. *ni-**no**-tlātia*
     1SG.N-1SG.REFL-hide 'I hide myself'
  b. ***ne**-tlāti-lo*
     USP.REFL-hide-PASS 'People hide'

In order to account for the reflexive allomorphy, one must assume that reflexivization applies after passivization, which contradicts Alsina's (1999) claim. The order V-REFL-PASS is not attested in Nahuatl.

Identical SFs are also generated with the combination of passive and antipassive:

(21) Combination of passive and antipassive
  V-PASS-ANTIPASS/V-ANTIPASS-PASS $\lambda s \exists y \exists x V(x,y)(s)$

It is, however, dubious whether languages should make use of both argument reductions; this only seems plausible if multiple argument extensions apply.

4.2 Diathesis combinations with different θ-grids

There are two cases in which diathesis combinations result in the same SF, but differ in their θ-grid: the combination of causative and passive on the one hand and the combination of antipassive and applicative on the other hand. Concerning the combination of causative and passive, the causer is existentially bound in the order V-CAUSE-PASS, whereas the causee is bound in the inverse order:

(22) Combination of causative and passive
   a. V-CAUSE-PASS
      λy λx λs' ∃u □s [ACT(u) & V(x,y)(s)](s')
   b. V-PASS-CAUSE
      λy λu λs' ∃x □s [ACT(u) & V(x,y)(s)](s')

The combination of causative and passive depends on constraints on structural linking and the requirement for morphologically encoded binding of arguments. V-PASS-CAUSE is superfluous in languages with optional (oblique) causees because there is no need to bind the causee. This affix order, however, is highly relevant in languages with obligatory (morphological) argument saturation or in languages with restrictions on structural linking: with the latter, causativization may be restricted to intransitive or transitive verbs. In Yucatec Maya, only two structural arguments are allowed (Krämer and Wunderlich 1999); therefore, causativization is restricted to intransitive verbs. In order to causativize an underlyingly transitive verb, argument reduction must take place.

(23) Causative/passive in Yucatec Maya (Bricker 1978:22)
   a. *k=u* *kǎan-s-ik*
      INCOMP=3 learn.PASS-CAUSE-IMPF
      'he is teaching him'
   b. *k=u* *kǎan-s-ǎal*
      INCOMP=3 learn.PASS-CAUSE-PASS.IMPF
      'he is being taught'

In (23a), the verb 'learn' is passivized before its argument structure is extended by a causer argument. (23b) shows that a causativized verb may undergo passivization. Therefore, both orders are attested in Yucatec Maya. The order V-CAUSE-PASS may be ungrammatical in languages that do not allow new arguments to be existentially bound or realized obliquely.

Depending on the order of application of antipassive and applicative, different arguments are existentially bound or realized obliquely. In this respect, the combination of antipassive and applicative is a mirror image of the combination of causative and passive. If antipassive precedes the applicative, the base object is existentially bound or realized obliquely as in (24a). Such an order of application is often used if the language exhibits restrictions on structural linking: the antipassive reduces the number of structural arguments thus allowing subsequent argument extension. If the antipassive follows the applicative, the applied argument is existentially bound or realized obliquely as in (24b).

(24) Combination of antipassive and applicative
   a. V-ANTIPASS-APPL $\lambda x\, \lambda s\, \square y\, V(x,y)(s)$
      $\rightarrow \lambda z\, \lambda x\, \lambda s\, \exists y\, [V(x,y)(s) \,\&\, \text{APP}(s,z)]$
   b. V-APPL-ANTIPASS $\lambda z\, \lambda y\, \lambda x\, \lambda s\, [V(x,y)(s) \,\&\, \text{APP}(s,z)]$
      $\rightarrow \lambda y\, \lambda x\, \lambda s\, \exists z\, [V(x,y)(s) \,\&\, \text{APP}(s,z)]$

Languages that do not allow the existential binding of new arguments, should not display affix orders such as (24b); therefore, the combination of antipassive and applicative may be restricted. In

West Greenlandic, applicative and antipassive may be iterated, thus transparently showing both affix orders:

(25) Antipassive/applicative in West Greenlandic (Fortescue 1984:270)

a.	*ani-vuq*	'he went out' (V-3SG)
b.	*anni-p-paa*	'he went out with it' (V-APPL-3SG/3SG)
c.	*anni-s-si-vuq*	'he went out with something' (V-APPL-ANTIPASS-3SG)
d.	*anni-s-si-vig-aa*	'he went out with something to him' (V-APPL-ANTIPASS-APPL-3SG/3SG)

Note that West Greenlandic also exhibits several applicative variants and that the surface form is subject to many morphophonological processes.

The resulting verb forms of the combination of causative and antipassive differ in their linking patterns – at least in languages with asymmetric objects. Depending on the linking conditions in causativized transitive verbs (oblique causee vs. oblique base object), the antipassive existentially binds the structural internal argument of the causativized verb (compare (26a/b)); therefore, only the causer argument remains structural (str).

(26) Combination of causative and antipassive

a. V-CAUSE-ANTIPASS
   λx λu λs' ∃y ∃s [ACT(u) & V(x,y)(s)](s') [obl. causee]
   obl str
b. λy λu λs' ∃x ∃s [ACT(u) & V(x,y)(s)](s') [obl. base obj.]
   obl str
c. V-ANTIPASS-CAUSE
   λx λu λs' ∃y ∃s [ACT(u) & V(x,y)(s)](s')
   str str

If, however, the antipassive applies first, the base object must be existentially bound; therefore, the causee argument can be realized structurally. Note that Baker (1988) predicts both orders to be un-

grammatical. The following examples from Chamorro provide counter-evidence to his claim (West Greenlandic would also be a case in question). In (27a) the antipassive applies prior to causativization; as expected, the causee *häm* 'us' is realized structurally (as NOM-marked pronoun), whereas the base object is oblique. In (27b) the antipassive follows causativization (umlauting the causative morpheme); here, both causee and base object are oblique.[3]

(27) Causative/antipassive in Chamorro (Gibson 1992:175/150)

a. ha=na'-fan-aitai häm i ma'estrak-ku
3SG.E=CAUS-ANTIPASS-read 1PL.EX.N the teacher-1SG.P
ni esti na lebblu
OBL this LINK book
'My teacher made us read the book'

b. man-nä'-eksamina häm i doktu
PL-ANTIPASS.CAUS-examine 1PL.EX.N the doctor
as nana-n-mami
OBL mother-n-1PL.EX.P
'we had the doctor examine our mother'

5. Diathesis combinations that differ semantically

Since argument extensions are triggered by the integration of further predicates into the SF of the base verb, combinations of argument extensions yield outputs that differ according to their order of application. In addition, the combination of diathesis markers with reflexives or reciprocals may yield outputs that differ in their binding relations. I will begin with the discussion of the diathesis combinations that yield different SFs and different θ-grids.

5.1 Diathesis combinations with different θ-grids

Since some structures and processes universally single out the highest argument of verbs ('logical subject'), the order of application of

diathesis markers that introduce a highest argument is highly relevant. It is the combination of such diathesis markers that exhibits the strongest requirement and tendency for transparent affix orders. (28) represents the differences between the orders of application of assistive and causative. If the assistive applies first as in (28a), the causer u is the highest argument and, hence, realized as subject. If the causative applies first, the assister v is the highest argument, and the causer is identified with the assisted.

(28) Combination of assistive and causative
   a. V-ASS-CAUSE
      λy λx **λv λu** λs' ∃s [ACT(u) & ASSIST(v,x,V(x,y))(s)](s')
   b. V-CAUSE-ASS
      λy λx **λu λv** λs' ∃s [ASSIST(v,u,[ACT(u) & V(x,y)(s)]](s')

The following example from Quechua shows the predicted transparency. (29a) represents the order V-ASS-CAUSE, (29b) the order V-CAUSE-ASS.

(29) Causative/assistive in Quechua (van de Kerke 1996:179)
   a. *Maria-wan wawa-s-ta maylla-**ysi-chi**-wa-n*
      Maria-COM child-PL-ACC wash-ASS-CAUSE-1.A-3SG
      'she makes Maria help me wash the children'
   b. *Maria-wan wawa-s-ta maylla-**chi-ysi**-wa-n*
      Maria-COM child-PL-ACC wash-CAUSE-ASS-1.A-3SG
      'she helps me to make Maria wash the children'

Independent of the order of application, the causee is realized by the comitative and the assisted by object agreement, which indicates a certain asymmetry between the causative and the assistive, requiring further elaboration.

Additional examples from Quechua and other languages (e.g. the iteration of causatives) confirm the prediction that the combination of diathesis markers introducing a highest argument should always be transparent.

The combination of causative and assistive is partly mirrored by the combination of applicatives. Depending on the order of application, the resulting verbs differ in their SF and their θ-grid.

(30) Combination of Applicatives
   a. V-APP$_1$-APP$_2$
      λv λu λy λx λs [V(x,y)(s) & APP$_1$(s,u) & APP$_2$(s,v)]
   b. V-APP$_2$-APP$_1$
      λu λv λy λx λs [V(x,y)(s) & APP$_2$(s,v) & APP$_1$(s,u)]

In contrast to the combination of diathesis markers that introduce a highest argument, the combination of applicatives underlies language-specific linking constraints and, thus, does not exhibit global uniformity. In languages with asymmetric objects, the applied argument introduced last is predicted to be realized as structural object, whereas the internal argument introduced by the first applicative is oblique. With these languages, affix orders should be clearly distinguished due to their structural effects. In languages with symmetric objects, the order of application does not play a role: both internal arguments are structural and may be accessed likewise. Despite its structural relevance one hardly finds examples for multiple applicatives in which both orders are attested. Many languages – even those with asymmetric objects – have a strong preference for one of the possible orders of applicatives. In Tukang Besi, for instance, the combination of locative and comitative applicative is restricted: only the order LOC-COM is possible and the comitative argument 'with my younger sister' is realized structurally (i.e. NOM), as expected. [4]

(31) Locative/Comitative applicative in Tukang Besi
   (Donohue 1999:249)
   ku-wil(a)-**isi-ngkene**-'e **na** iai-su
   1SG-go-LOC-COM-3.A NOM younger.sister-1SG.P
   (di ompu-su)
   OBL grandparent-1SG.P
   'I visited my grandmother with my younger sister'

In contrast, the combination of comitative and benefactive applicative is opaque: the morphological order is restricted to COM-BEN (compare (32a/b)); however, only the comitative argument 'with her friend' can be realized structurally (compare (32a/c)), suggesting a scope relation COM over BEN.

(32) Benefactive/comitative applicative in Tukang Besi (Donohue 1999:248/252)

a. no-homoru-**ngkene-ako-**'e te iaku na kene-no
3.REAL-weave-COM-BEN-3.A CORE 1SG NOM friend-3.P
te wurai te ompu-su
CORE sarong CORE grandparent-1SG.P
'my grandmother wove a sarong for me with her friend'

b. * no-homoru-**ako-ngkene**

c. * no-homoru-**ngkene-ako**-aku te kene-no
3.REAL-weave-COM-BEN-1SG.A CORE friend-3.P
te wurai na ompu-su
CORE sarong NOM grandparent-1SG.P
'my grandmother wove a sarong for me with her friend'

5.2 Diathesis combinations with identical θ-grids

Among the combinations of diathesis markers that differ in their semantic output are some that still have an identical θ-grid. This is due to the fact that the two orders only differ in the predicate's argument variables. A clear case is given by the combination of causative and reflexive/reciprocal. The order V-CAUSE-REFL is predicted to allow two readings in principle: one in which the causer binds the causee as in (33ai) and one in which the causer binds the base object as in (33aii). Note, however, that this binding may violate locality constraints of particular languages because the causee is a potential interfering binder. The affix order V-REFL-CAUSE only allows the reading in which the causee binds the base object as in (33b).

(33) Combination of causative and reflexive/reciprocal[5]

a. V-CAUSE-REFL (i) λy λu λs' ∃s [ACT(**u**) & V(**u**,y)(s)](s')
(ii) λx λu λs' ∃s [ACT(**u**) & V(x,**u**)(s)](s')

b V-REFL-CAUSE λx λu λs' ∃s [ACT(u) & V(**x**,**x**)(s)](s')

Some dialects of Quechua show the predicted affix orders and their corresponding interpretations:

(34) Combination of causative and reflexive in Quechua (van de Kerke 1996:180)

a. *maylla-**chi-ku**-n*
wash-CAUSE-REFL-3SG
(i) 'he lets himself be washed'
(ii) 'he causes himself to wash someone'

b. *maylla-**ku-chi**-n*
wash-REFL-CAUSE-3SG
'he causes someone to wash himself'

Other Quechuan dialects (van de Kerke 1996) display a restriction disallowing the affix order V-REFL-CAUSE, which might be explained by the fact that these dialects require the antecedent to be the highest argument of the verb.

Again, Classical Nahuatl exhibits the expected reflexive allomorphy. In (35b), the reflexive verb form is causativized so that the causee binds the internal argument, whereas in (35c) reflexivization operates on the causative verb form so that the causer binds the reflexive. In the first case, the unspecific reflexive is used, in the second case the specific reflexive.

(35) Reflexive/causative in Classical Nahuatl (Launey 1979:186)

a. ***mo**-tlaso'tla-'*
3.REFL-love-PL
'they love one another'

b. *ni-kin-**ne**-tlaso'tlal-tia* [REFL-CAUSE]
1SG.N-3PL.A-USP.REFL-love-CAUSE
'I cause them to love one another'

c. *ni-k-**no**-tti-tia* [CAUSE-REFL]
1SG.N-3SG.A-1SG.REFL-see-CAUSE
(i) 'I show myself to him'
(ii) 'I make him see me'

There are also languages that show restricted affix orders for CAUSE/REFL: Kinyarwanda (Kimenyi 1980) exhibits only the morphological structure [REFL-V-CAUSE], which is structurally ambiguous. However, the interpretation based on the order V-REFL-CAUSE is blocked; the reflexive must be bound by the highest argument. In contrast, Tukang Besi (Donohue 1999) does not allow the order V-CAUSE-REC in the combination of causative and reciprocal.

The combination of causative and applicative also yields two affix orders that differ in semantic terms. With the order V-CAUSE-APPL, the applied argument is expected to be related to the complex situation of causation as in (36a), whereas with the order V-APPL-CAUSE, the applied argument should be related to the subevent denoted by the base verb, as shown in (36b).

(36) Combination of causative and applicative
a. V-CAUSE-APPL
λz λy λx λu λs' ∃s [[ACT(u) & V(x,y)(s)](s') & APP**(s'**,z)]
b. V-APPL-CAUSE
λz λy λx λu λs' ∃s [ACT(u) & [V(x,y)(s) & APP**(s**,z)]](s')

The interpretational differences become evident with instrumental and locative phrases: is the instrument part of the causing event or part of the subevent denoted by the base verb? Likewise, does the locative refer to the place of the causing event or to the place where the action denoted by the base verb is situated?

However, the order V-APPL-CAUSE is rarely attested, which led Baker to conclude that this order is ungrammatical in any case. Evidence for such an order is found, for instance, in Chamorro (and with certain verbs in Tukang Besi, see Donohue 1999). Overtly, the two affix orders cannot be distinguished because the causative is realized

as prefix and the applicative as suffix. The linking patterns indicate the underlying derivation: (37a) corresponds to the order V-CAUSE-APPL because the applied argument is realized by the nominative (NOM). Every derivation subsequent to the applicative would render the applied argument oblique, which is not the case in (37a). In (37b), the causee is realized by the nominative, which can only be explained with respect to the order V-APPL-CAUSE. Note that the applied argument 'Joaquin' is related to the subevent of telling a story.

(37) Causative/applicative in Chamorro (Gibson 1992:110/122)
   a. hu=**na'**-puni'-**i** yu' nu i bäbui as Juan
      1SG.E=CAUS-kill-APPL 1SG.N OBL the pig OBL Juan
      'I made Juan kill me the pig' [CAUS-APPL]
   b. si tata-hu ha=**na'**-sasngan-**i** yu'
      NOM father-1SG.P 3SG.E=CAUS-tell-APPL 1SG.N
      as Joaquin nu i estoria-mu
      OBL J OBL the story-2SG.P
      'my father made me tell Joaquin your story' [APPL-CAUS]

As overwhelming tendency, the combination of causative and applicative is realized by means of the opaque affix order V-CAUSE-APPL. This is true, for instance, for Quechua, as the following example illustrates:

(38) Causative/applicative in Quechua (van de Kerke 1996:192)
   *mama-y Ana-wan chompa-ta ruwa-**chi-pu**-wa-n*
   mother-1SG.P Ana-COM sweater-ACC make-CAUSE-APPL-1-3SG
   a. 'in my place my mother made Ana make a sweater'
   b. 'my mother made Ana make a sweater in my place'
   c. 'my mother made Ana make me a sweater'

Reading (38a) is compositional, whereas the other two readings in which the beneficiary is related to the subevent denoted by the base verb, are not. Similarly, Chichewa and Nahuatl only exhibit opaque affix orders with CAUS/APPL. The Chichewa sequence *lir-its-ir* ('cry-CAUSE-APPL') occurs for an instrumental applicative in which the instrument is used in the causing event as well as for a benefactive

applicative in which the beneficiary is related to the crying event (Hyman and Mchombo 1992).

The fact that the combination of causative and applicative shows the strongest tendency for opaque affix orders among all diathesis combinations suggests that the difference in meaning is not very crucial and, hence, is not reflected in morphology. The sortal properties of the applied argument determine to which situation argument it is related.

6. Diathesis combinations with a potential subsumption relation

There are also cases in which one of the two affix orders may be semantically or structurally ambiguous such that it subsumes the interpretation or the linking pattern of the inverse order.

6.1 Potential semantic subsumption

Potential semantic subsumption is found with the combination of applicative and reflexive/reciprocal. The order V-APPL-REFL has two possible interpretations, namely those indicated in (39a): the highest argument binds the applied argument as in (39ai) or the base object as in (39aii).[6] The inverse order can only have an interpretation that is identical to (39aii).

(39) Combination of applicative and reflexive/reciprocal

a.	V-APPL-REFL	(i) λy λx λs [V(**x**,y)(s) & APP(s,**x**)]
		(ii) λz λx λs [V(**x**,**x**)(s) & APP(s,z)]
b.	V-REFL-APPL	λz λx λs [V(**x**,**x**)(s) & APP(s,z)]

Therefore, V-APPL-REFL subsumes V-REFL-APPL in principle. Such a subsumption may result in two compensation strategies: V-REFL-APPL may either block interpretation (ii), perhaps due to a high-ranked ambiguity constraint, or it may be blocked morphologically by the order V-APPL-REFL because some kind of economy constraint

rules out superfluous morphological structure: the affix order with the wider extension is preferred.

In Chichewa both affix orders occur and show the full range of possible interpretations: the order V-APPL-REC is ambiguous, as (40a/c) show, and does not block the inverse order (see (40b)), a fact that needs further investigation.[7] If the reciprocal is the inner morpheme, a wellformedness constraint requires that a copy of the reciprocal is added to the following diathesis marker.[8]

(40) Applicative/reciprocal in Chichewa
(Hyman & Mchombo 1992, Alsina 1999:12)
a. *mang-ir-an-* 'tie for each other'
tie-APPL-REC
b. *mang-an-ir-an-* 'tie each other for/with/at'
tie-REC-APPL-AN
c. *alēnje* *a-na-mény-ér-an-á* *míkôndo*
hunters.2 CL.2-PAST-hit-APPL-REC-FV spears.4
'the hunters hit each other with spears'

Classical Nahuatl distinguishes the two readings due to the selection of the reflexive allomorph: if the applied argument is bound, the specific reflexive is used as in (41a), if, however, the base object is bound, the unspecific reflexive is used as in (41b).

(41) Applicative/reflexive in Classical Nahuatl (Launey 1979:196)
a. *ni-k-**no**-kwī-**lī**-s*
1SG.N-3SG.A-1SG.REFL-take-APPL-FUT
'I will take it for myself'
b. *ni-k-**ne**-tlātī-**lia***
1SG.N-3SG.A-USP.REFL-hide-APPL
'I hide myself from him'

Morphological structures such as those of Nahuatl do not allow any conclusion with respect to the underlying affix order in case of subsumptive relations.

6.2 Potential structural subsumption

Depending on the symmetry of objects, the orders of combining applicative and passive must be distinguished. Generally, the order V-PASS-APPL only allows the internal argument of the base verb to be realized as the subject of a passive verb because the applied argument is not locally accessible (see (42a)). In languages with asymmetrical objects, V-APPL-PASS only displays a structure with the applied argument being the subject of the passive verb (see (42b)). In languages with symmetrical objects both internal arguments may be alternatively realized as subject. In this case, the order V-APPL-PASS subsumes the inverse order with respect to its linking potential.

(42) Combination of applicative and passive

a. V-PASS-APPL

λz **λy** λs ∃x [V(x,y)(s) & APP(s,z)]

NOM

b. V-APPL-PASS

λz λy λs ∃x [V(x,y)(s) & APP(s,z)]

NOM (NOM)

Note, however, that V-PASS-APPL is excluded in languages in which applicatives require the presence of a specified structural highest argument; this is, for instance, relevant in Tukang Besi (Donohue 1999:297).

In Chichewa, instrumental and benefactive applicatives may only occur in the order V-APPL-PASS. As in Tukang Besi, these applicatives require a specified structural agent argument. With the locative applicative, both orders occur:

(43) Passive/locative applicative in Chichewa
(Alsina 1999:10/11, Alsina and Mchombo 1993:42)

a. *ukōnde u-ku-lúk-**ír-idw**-á* *pá-mchenga*
net.14 CL.14-PRES-weave-APPL-PASS-FV CL.16-sand.3
(ndí ásōdzi)
by fishermen.2
'the net is being woven on the sand (by fishermen)'

b. *ukōnde u-ku-lúk-**idw-ír**-á* *pá-mchenga*
net.14 CL.14-PRES-weave-PASS-APPL-FV CL.16-sand.3
(ndí ásōdzi)
by fishermen.2
'the net is being woven on the sand (by fishermen)'

c. *pa-mchēnga pa-ku-lúk-ír-idw-á* *míkêka*
CL.16-sand.3 CL.16-PRES-weave-APPL-PASS-FV mats.4
'the beach is being woven mats on'

The order V-APPL-PASS is structurally ambiguous (see (43a/c)) because this applicative licences object symmetry; hence, both the applied argument and the base object may be promoted to subject position. The fact that both (43a) and (43b) are acceptable although a blocking effect is expected needs to be clarified.

7. Conclusions

The preceding discussion has shown that, in principle, diathesis markers can be combined in any order. In the case of passive and reflexive and passive and antipassive, an identical output is generated. It is the intermediate step that might favor one affix order over the other, depending on the linking constraints of the relevant language. The following table summarizes the findings along the following dimensions: (a) whether an identical SF is generated, (b) whether the two orders yield an identical θ-grid, (c) whether there may still be differences in the resulting linking patterns despite an identical θ-grid and (d) whether the diathesis combination is influenced by the specific linking conditions of the language in question.

The last column indicates the tendency with respect to the actual affix orders: t – transparent, r – restricted, o – opaque). However, further typological studies are necessary to validate the observed patterns.

(44) Properties of diathesis combinations

	same SF	same θ-grid	same linking pattern	parameterized according to linking profile	affix order
PASS/REFL	+	+	+	+	r
PASS/ANTIPASS	+	+	+	+	?
CAUSE/ANTIPASS	+	–/+	+	+	t/r
APPL/REFL	+/–	+	+	+	t/r
PASS/APPL	+	+	+/–	+	r
CAUSE/PASS	+	–	–	+	t/r
ANTIPASS/APPL	+	–	–	+	t/r
CAUSE/REFL	–	+	+	+	t/r
CAUSE/APPL	–	+	+	+	o/t
CAUSE/ASS	–	–	–	–	t
APPL/APPL	–	–	–/+	+	r/o

Restricted affix orders mostly result from language-specific constraints on linking. Since almost all diathesis combinations interact with the linking profile of the language, restrictions are expected. The only invariant diathesis combination (causative and assistive or iteration of causatives) exhibits the predicted transparency.

Up to now, only two cases of opaque affix orders have been attested: the combination of causative and applicative and multiple applicatives. In both cases, argument-extending diatheses are combined, which pose a challenge for structural linking in most languages. Apart from the fact that the factors that trigger opacity need to be determined, opacity in itself is a serious problem for morpheme-based approaches. If one does not want to make use of late-insertion models (*Distributed Morphology*, Halle and Marantz 1993), post-syntactic filters, morphological circumscriptions (Hyman and Mchombo 1992) or covert LF-movements, which are all very power-

ful mechanisms, the question arises as to which alternatives are available. Moreover, one must ask whether the semantics is processed at each step of morphological concatenation, which is desirable from isomorphism, or whether semantic processing may be postponed. The latter alternative may be plausible if it can be constrained. Therefore, further studies must show whether opacity is strictly local, involving only adjacent morphemes.

Another challenge is given by subsumptive affix orders. To what extent do the predicted blocking effects occur? How may they be modelled? A possible solution might be provided within the framework of *Bidirectional Optimality Theory* (Blutner 2000).

Finally, a typology of possible affix orders is not easily available within *Optimality Theory* because diathesis combinations interface with different modules of the grammar (syntax, semantics, morphology, discourse factors), which might not be evaluated parallel in one step.

Notes

* This paper is based on research that has been conducted within the Sonderforschungsbereich 'Theory of the Lexicon', funded by the German Science Foundation (DFG). I would like to thank Dieter Wunderlich, the audience in Leipzig and the anonymous reviewer for helpful comments. Throughout the paper, I will make use of the following abbreviations: '=': clitic boundary, '#': deviant semantic interpretation; A: object agreement, ACC: accusative, ANTIPASS: antipassive, APPL: applicative, ASP: aspect, ASS: assistive, BEN: benefactive applicative, CAUSE: causative, CL: class marker, COM: comitative (case/ applicative), CORE: core case, E: ergative agreement, EX: exclusive, FUT: future tense, FV: final vowel, HORT: hortative, IMPF: imperfective, INCOMP: incompletive aspect, INT: intensifier, LINK: linker, LOC: locative applicative, MOD: modifier, N: subject agreement, NOM: nominative, NOML: nominalization, OBL: oblique, P: possessor agreement, PASS: passive, PAST: past tense, PL: plural, PRES: present tense, REC: reciprocal, REFL: reflexive, REP: repetitive, SG: singular, USP: unspecified

1. I assume that the causative morpheme is a functor on the verb with the following Semantic Form: $\lambda P\, \lambda u\, \lambda s'\, \exists s\, [\mathrm{ACT}(u)\ \&\ P(s)](s')$
   The causative integrates a verbal predicate P via functional composition, binds its situational variable and adds the causer argument u and the complex situ-

ational variable s' (Wunderlich 1997b). ACT denotes an unspecified activity. The causal relation is inferred from conceptual coherence constraints (Kaufmann 1995). Modifiers that do not add arguments can also be represented as functors on verbs.

2. Given that ditransitives should be included in the discussion of reflexive binding, I do not see a possibility to represent the reflexive morpheme as a functor on the verb. Therefore, I assume that it might be represented as a template that operates on the base verb's SF (with consequences for λ-abstraction).
3. Although the causee 'the doctor' does not receive an oblique marker, its position (following the subject) renders it oblique in (27b). In (27a) the causee precedes the subject.
4. Tukang Besi has an unusual linking system. The subject of intransitive verbs is marked by NOM. With transitive verbs, the object is marked by NOM if the verb exhibits object agreement; otherwise the subject is marked by NOM. Structural arguments that are not realized by NOM are marked by the 'core marker' *te*.
5. Note that (33ai) is preferred with reciprocals and (33aii) with reflexives.
6. Interpretation (39aii) may be blocked if a language requires the reflexive to correspond to a structural argument; in languages with asymmetric objects, the base object is often not structural and, hence, possibly not accessible to reflexivization.
7. One might speculate that the order V-REC-APPL is chosen in cases in which base object and applied object both qualify as target for anaphoric binding, i.e. with the benefactive applicative, and in which the binding of the base object is to be ensured. V-APPL-REC would then be used for the binding of the applied argument. With the other applicatives, such an ambiguity is less likely and V-REC-APPL is avoided as a superfluous form.
8. The numbers in (40c) indicate noun class.

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