

Operations on argument structure

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1. Preliminaries

Lexical items belonging to one of the major lexical categories (verb, noun, adjective, adposition) are generally considered to be predicates which have one, two, three, or even more arguments, represented by open slots or variables. An n-place predicate (of type $\langle e_n, \langle \dots, \langle e_1, t \rangle \dots \rangle \rangle$ in the simplest case) forms together with n argument variables an open proposition (of type t), while λ -abstraction forms a more articulated predicate (of the same complex type) from it, for instance with n=3:

$$(1) \quad \lambda z \lambda y \lambda x \text{ PRED}(x,y,z) \text{ of type } \langle e, \langle e, \langle e, t \rangle \rangle \rangle$$

If such an expression is applied on a series of argument expressions, it gets converted into a saturated proposition, for instance

$$(2) \quad \lambda z \lambda y \lambda x \text{ PRED}(x,y,z) (a)(b)(c) \text{ becomes } \text{PRED}(a,b,c).$$

Both λ -abstraction and λ -conversion are stepwise operations: stepwise λ -abstraction produces a λ -sequence, and stepwise λ -conversion works off this sequence backwards.

One can identify PRED with what an individual verbal, nominal, adjectival, or adpositional item contributes semantically, and the series of argument expressions with what the morphological or syntactic complements of that item contribute semantically.

There are some specific differences between the lexical categories. Nouns can be used predicatively (*this is John's house*) or referentially (*let us meet at John's house*), a fact that in some languages is marked by a nominal vs. verbal clause type; all other categories only allow predicative use. The highest argument of a noun is said to be its referential argument R; in the referential use the noun functions as a complement of another predicate expression (e.g., *meet_at*), and R is identified with an argument of this predicate, while in the predicative use R is overtly expressed together with the noun. Although verbs can only be used predicatively, they still refer to some sort of temporal event and therefore can be said to have a referential argument E; it is specified (or bound) by functional elements such as aspect, tense, mood, but never by a complement. If the verb undergoes event nominalization (*our meeting at John's house*), E becomes R of the resulting noun. In view of these differences, the featural encoding of argument hierarchy disregards the event argument of a verb but pays regard to the referential argument of a noun. That is, the highest argument of a transitive verb usually is an agent, while the highest argument of a relational noun is R. Concerning adjectives and adpositions, most linguists think that they lack a referential argument, so that no specific functional elements are found with them. To anchor the information of adjectives and adpositions, they must be constructed together with some noun or verb as an attribute, adverbial, or secondary predicate.

The representations in (3) to (5) illustrate the predicate-argument structure of a few examples. The possessed noun is considered to be derived from the simple noun. Similarly, the transitive variant of *cook* can be derived from the intransitive variant, and it can further undergo event and agent nominalization. Adjectives as well as adpositions can have one or two arguments.

- (3) Nouns and possessed nouns
- | | | |
|-----------------------------|---|-------|
| a. <i>house</i> : | $\lambda x \text{ HOUSE}(x)$ | $x=R$ |
| b. <i>someone's house</i> : | $\lambda y \lambda x [\text{HOUSE}(x) \ \& \ \text{POSS}(y,x)]$ | $x=R$ |
- (4) Verbs and nominalizations
- | | | |
|--------------------------------|--|-------|
| a. <i>cook</i> , intransitive: | $\lambda y \lambda s \text{ COOK}(y)(e)$ | $e=E$ |
| b. <i>cook</i> , transitive: | $\lambda y \lambda x \lambda e [\text{AGENT}(x) \ \& \ \text{COOK}(y)](e)$ | $e=E$ |
| c. <i>cooking</i> , noun : | $\lambda y \lambda x \lambda e [\text{AGENT}(x) \ \& \ \text{COOK}(y)](e)$ | $e=R$ |
| d. <i>cook</i> , noun : | $\lambda y \lambda x \exists e [\text{AGENT}(x) \ \& \ \text{COOK}(y)](e)$ | $x=R$ |

- (5) Adjectives and adpositions/adverbs
- | | | | |
|--------------------|-----------------------------------|------------------|----------------------|
| a. <i>proud</i> : | $\lambda y \lambda x$ PROUD(x,y) | <i>quick</i> : | λx QUICK(x) |
| b. <i>behind</i> : | $\lambda y \lambda x$ BEHIND(x,y) | <i>quickly</i> : | λx QUICK(x) |

Arguments except R and E are sometimes called participants, they must be realized by some pronominal affix or syntactic complement – otherwise existential closure would have to take place in order to yield a saturated proposition. The preceding sequence of λ -abstractors thus indicates that part of a lexical item that is morpho-syntactically active.

Looking at the above representations, three distinct but related notions of argument structure come into mind. (i) Argument structure is identified with the different semantic roles of the participants x , y , z in the predication, for instance, x =agent(e), y =recipient(e), z =theme(e) for a ditransitive verb of the *give* type. (ii) Argument structure is identified with the sequence of λ -abstractors modelling the requirement of complements; the λ -abstractors can thus be regarded as generalized θ -roles. (iii) Argument structure is identified with the structure of complement expressions (a)(b)(c) that realize the argument requirements of a predicate; of course, (a)(b)(c) can vary in various ways, including position and morphological case. In any case, the notion of argument structure plays a role for all lexical categories. Only because verbs are particularly complex they are in the centre when one considers (operations on) argument structure. Stiebels (2006) argues, however, that nouns can in principle show the same types of operations as verbs.

In this article, I restrict the discussion to verbs. λe VERB(x,y,z)(e) is called the semantic core of a verb (in this case, of a ditransitive verb), and $\lambda z \lambda y \lambda x$ CORE is assumed to be the θ -structure representing the argument hierarchy, with x as the highest, and z as the lowest argument. With the exception of Neo-Davidsonian accounts, which do not assume any inherent argument hierarchy, usually the CORE of a lexical item is thought of as inherently structured, either indirectly in virtue of the semantic role hierarchy or directly by lexical decomposition. Part of this structure is preserved in the argument hierarchy, which in turn is mapped onto a morpho-syntactic structure. The θ -structure thus interfaces between semantic core and morpho-syntactic structure, it is, so to say, the negative print of a hierarchy inherent to CORE and can produce various morpho-syntactic positive copies of that hierarchy. For instance, the ordering $\lambda z \lambda y \lambda x$ (to be read from right to left) is mapped onto the default ordering X Y Z (to be read from left to right) in the syntax.

There are two sorts of tests for argument hierarchy: (i) Binding properties: The higher argument can asymmetrically bind the lower argument (Barss & Lasnik 1986, Larson 1988). (ii) Harmonic alignment: The higher argument is more likely to be more salient (in terms of person, animacy, definiteness, topic, and so on) than the lower argument (Wunderlich 2006).

Linguists in the tradition of Grimshaw 1990, Jackendoff 1990, Dowty 1991 etc. assume a direct mapping from semantic core properties onto morpho-syntactic structure. The assumption of a separate θ -structure (θ S), however, is advantageous for a couple of reasons (Wunderlich 1997).

i. Expletive arguments can be represented by additional λ -elements that do not have a variable as semantic counterpart in CORE.

- (6) Expletive arguments
- | | |
|----|---------------------------|
| a. | Es schneit. ('It snows.') |
| b. | λx GO(SNOW) |

ii. The argument hierarchy can be represented most transparently by featural encoding, for instance, using the features +hr = 'there is a higher argument role', and +lr = 'there is a lower argument role'. This in turn gives rise to structural case assignment: Dative ([+hr,+lr]) is compatible with the medial argument role, accusative ([+hr]) with a non-highest, ergative ([+lr]) with a non-lowest, and nominative ([]) with any argument role.

- (7) Featural encoding of the argument hierarchy:
- | | |
|----|---|
| a. | Er kaufte ihr einen Ring. ('He bought her a ring.') |
| b. | $\lambda z \lambda y \lambda x$ PRED(x,y,z) |
| | +hr +hr -hr |
| | -lr +lr +lr |

iii. Lexically marked case can be represented through pre-association of a hierarchy feature, thereby overriding the default feature (lexical features have precedence).

- (8) Lexical marked vs. unmarked case.
 a. Er gefiel ihr. Sie mochte ihn. (Both: ‘She liked him.’)
 b. $\lambda y \lambda x \text{ LIKE}(x,y)$ $\lambda y \lambda x \text{ LIKE}(x,y)$
 +hr
- iv. Individual elements of θS can be associated with sortal restrictions such as animacy, and subcategorization information such as prepositional case or infinitive/participle for dependent verbs.
- (9) Association with SUBCAT information.
 a. Er wartete auf Diana. (‘He waited for Diana.’)
 b. $\lambda y \lambda x \text{ WAIT}(x,y)$
 AUF
- v. The working of certain valency-decreasing operations can easily be represented.
- (10) Valency-decreasing operations.
 a. Er wurde geliebt. (‘He was loved.’ = ‘Someone loved him.’)
 b. $\lambda y \exists x \text{ LOVE}(x,y)$

Valency-decreasing operations such as passive and antipassive can directly be defined on the θ -structure (section 2). In contrast, valency-increasing operations such as causative and applicative do not only add an argument but also a licensing predicate, and thus enrich the semantic core (section 3). The question of how exactly these valency-increasing operations do function is dealt with in section 4. The problem of multifunctional derivational affixes, which, e.g., can signal causative in one context but anticausative in another context, is subject of section 5. The ordering of operations is considered in section 6. Two further types of argument alternations are only briefly touched: those that come about through lexical marking (section 7), and those that follow from the choice in a set of complementary core predicates (section 8).

Most operations on argument structure can be marked morpho-syntactically (by derivational affixes or syntactic constructions), or can be left unmarked and only visible by their effects in the morpho-syntactic complement structure. Languages widely differ in the amount of marking, and, of course, in the specific means of realizing these operations. English, e.g., often leaves the causative unmarked but marks the passive (11), whereas Basque rather marks the causative and leaves the passive unmarked (12).

- (11) a. The horse galloped.
 b. Someone galloped the horse.
 c. The horse was galloped.
- (12) a. Mikel joan da. (‘Mikel is gone.’)
 M. GO.PERF 3.be
 b. Mikel joan-araz-i du. (‘Someone made Mikel go.’)
 M. go-CAUS-PERF 3E/3N.have
 c. M. joan-araz-i da. (‘Mikel was made to go.’)
 M. go-CAUS-PERF 3.be

With GALLOP being a typical intransitive predicate, the two-argument clause (11b) is only intelligible if a further predicate introducing the extra argument is assumed. Similarly, a causativized verb activating only one argument, as in (12c), suggests some kind of covert argument reduction. Operations that must be inferred from the listener can only apply in canonical instances, whereas a marked operation can also apply in more peripheral instances and also can lead to idiomatic lexicalization.

A still open question is why all these operations do exist. The most plausible answer is that every participant of an event should get the privilege to be expressed as the most prominent argument (discourse anchor or topic, syntactic pivot or subject). For that reason, most operations even can apply in series. Many languages allow for at most two structural arguments, for instance, arguments that are co-referenced on the verb; here, the effect of argument extension often is promotion of another participant to structural object, which means that it is made more ‘visible’ to the listener.

One last general remark. The deponential verbs of Latin (such as *auxiliari* ‘help’, *minari* ‘threaten’, *partiri* ‘divide’) are semantically active, but nevertheless require passive morphology in their inflection (*auxili-or tibi* ‘help-1sg.PRES.PASS you’, ‘I help you’). One can assume that these verbs have the *lexical* feature +pass, which triggers passive morphology, and at the same time blocks the semantic operation of passive. This shows that the morphological exponent of an operation and the operation itself must be distinguished. In this article, mismatches between lexical features and morphosemantic operations are not considered any more.

2. Argument reduction: Passive, Antipassive, Reflexive, and others

Valency-decreasing operations reduce the number of syntactically active arguments; they apply directly on the θ -structure. (13) shows the passive, which binds the highest argument existentially, so that that it remains unexpressed. (The event argument is irrelevant here and therefore ignored.)

(13) PASS [... λx VERB(x, ...)] = ... $\exists x$ VERB(x, ...)

Some languages only allow passivization of transitive verbs, while other languages also include some subclasses of intransitive verbs. In general, the class of verbs that can be passivized is restricted to agentive verbs, but idiosyncratically, some nonagentive verbs can be included as well. Existential binding brings about that the passivized n-place verb is realized with at most n-1 morphosyntactic complements; thus, a transitive verb is detransitized, and an intransitive verb becomes impersonal. As a consequence, another argument can undergo default realization (nominative) or become syntactic subject. (14) and (15) show that in the passive of ditransitive verbs different options exist regarding the object that becomes nominative. In the two languages illustrated here (Yaqui and Georgian), both objects are marked by accusative in the active. If the recipient shifts to nominative in the passive (as in Yaqui) it is said to be the primary object, while if the theme shifts to nominative (as in Georgian) it is said to be the direct object (Dryer 1986).

(14) Double accusative and passive in Yaqui (Van Valin 2002:20)

- a. Joan Peo-ta ?uka vaci-ta miika-k.
Juan Pedro-ACC DET.ACC corn-ACC give-PERF
‘Juan gave Pedro the corn.’
- b. Peo ?uka vaci-ta miik-wa-k.
Pedro DET.ACC corn-ACC give-PASS-PERF
‘Pedro was given the corn.’
- c. *U?u vaci Peo-ta miik-wa-k.
DET.NOM corn Pedro-ACC give-PASS-PERF
‘The corn was given to Pedro.’

(15) Double accusative and passive in the present series of Georgian (Joppen-Hellwig 2001:50)

- a. Ketino Eka-s xaliṭṣa-s s-čukni-s.
Ketino Eka-ACC carpet-ACC 3D-present-PRES.3N
‘Ketino presents Eka with a carpet.’
- b. xaliṭṣa e-čuk-eb-a Eka-s.
carpet PASS-present-TH-PRES.3N Eka-ACC
‘The carpet is presented to Eka.’
- c. * Eka e-čuk-eb-a xaliṭṣa-s.
Eka PASS-present-TH-PRES.3N carpet-ACC
‘Eka is presented with a carpet.’

Passivization not only is a test for subjecthood (answering the question of which argument is demoted in the passive) but also for objecthood, in that a distinction can be made between primary (vs. secondary) and direct (vs. indirect) object. Languages with symmetric objects (Bresnan and Moshi 1990) allow both alternatives: either the recipient or the theme becomes the syntactic subject in the passive. These differences clearly show us that the promotion to nominative is not part of the passive itself but rather a subsequent effect dependent on typological factors.

Passive is an operation found in nearly every language because it reflects a ubiquitous salience shift. If an argument other than the highest one is the actual topic, definite/specific, or a speech act participant, it is often more salient than the highest argument; in this case, passive can enforce it to get promoted to a higher argument position, in order to make visible its higher saliency. In most languages, the passive operation is marked by a verbal affix, a particle, or an auxiliary, but it can be made visible also by a shift in the complement pattern even if a separate marker of the passive is lacking. In some languages, the highest argument of a passivized verb can nevertheless be expressed by an oblique instrument, source, or agent phrase; such a phrase can be considered to be an adjunct that is coindexed with the existentially bound argument. Various theories of the passive have been proposed, among them the voice hypothesis (Kratzer 1994), claiming that verbs have a basic form without agent, and only if they are integrated into a voice phrase, an agent is either added (in the active voice) or not (in the passive voice). This hypothesis suggests that active voice is the more marked variant of a verb, which, however, is only rarely found (e.g., in languages of the Austronesian family). Moreover, it can describe the semantic effect of passive as existential binding only by stipulation.

In view of examples such as those in (16), Keenan (1980) and Dowty (1982) argued that English passive must operate on transitive verb phrases rather than verbs, e.g., on the VP *think cancer to be unlikely to be caused by hot dogs* in (16a). However, already Bresnan (1982) showed that a lexical rule of passive is able to handle these more complex instances, too.

- (16) Passive of raising and control predicates (Bresnan 1982: 65)
- a. Cancer is now thought to be unlikely to be caused by hot dogs.
 - b. Intruders are now forced to be prepared to be attacked by dogs.

Let us assume that (17a) represents the passive of *think* and (17b) the embedded complex (itself being passivized), then (17c) results through functional composition as the approximate representation of (16a). This shows how the most internal argument is shifted to the subject of the whole complex by means of two passive operations. In a polysynthetic language such as Greenlandic all the higher predicates are affixes, so that the operations in fact would be word-internal.

- (17) Analysis of raising + passive
- a. $\lambda p \exists x \text{ THINK}(x, p)$
 - b. $\lambda z \exists y \text{ UNLIKELY}(\text{CAUSE}(y, z))$
 - c. $\lambda z \exists x \text{ THINK}(x, \exists y \text{ UNLIKELY}(\text{CAUSE}(y, z)))$

Similarly, with the three pieces in (18a) one gets (18b) in the first step, and (18c) in the second step, representing (16b). Here, the most internal argument is stepwise identified with the subject of *be prepared* and the object of *force*; again, two passives are involved.

- (18) Analysis of control + passive
- a. $\lambda z \exists u \text{ ATTACK}(u, z)$
 $\lambda P \lambda y \text{ PREPARED}(y, P(y))$
 $\lambda Q \lambda x \exists v \text{ FORCE}(v, x, Q(x))$
 - b. $\lambda y \text{ PREPARED}(y, \exists u \text{ ATTACK}(u, y))$
 - c. $\lambda x \exists v \text{ FORCE}(v, x, \text{PREPARED}(x, \exists u \text{ ATTACK}(u, x)))$

Antipassive is the counterpart to passive; it binds the lowest (rather than the highest) argument existentially, as shown in (19).

- (19) $\text{ANTIPASS} [\lambda z \dots \text{VERB}(\dots, z)] = \exists z \dots \text{VERB}(\dots, z)$

While the passive is induced by a particularly high salience status of the lower argument, the antipassive is induced by a particularly low status of this argument. It is therefore expected to be a less universal operation than passive. Whereas a canonical nominative-accusative verb turns to \emptyset -nominative by passivization, a canonical ergative-nominative verb turns to nominative- \emptyset by antipassivization; in both instances, a realization with a marked case is avoided. Although

antipassive is particularly often found in ergative languages it is not restricted to this type of language, so as passive is not restricted to accusative languages. A language can show both passive and antipassive by means of marked morphemes; an example is shown in (20). One often finds a combination of causative with antipassive, as in (20c); see also *he is cleaning* derived from the causative verb *to clean* in English. ‘Ubspecific object deletion’ in languages such as German or English is just a way of antipassive without using a morpheme.

(20) Passive, antipassive, and causative+antipassive in Zoque (Johnson 2000)

- a. huʔc-ʔəm-wə bi wakaš.
stab-PASS-COMPL DEF COW
‘(They) killed the cow.’
- b. behča cəm-ʔoy-pa.
horse carry-ANTIP-INCOMPL
‘The horses will carry (it).’
- c. miš-yak-keš-ʔoy-wə-ʔam dey.
2>1-CAUS-eat-ANTIP-COMPL-NOW now
‘Now you have already fed me.’

What is known as antipassive in the Eskimo languages, seems a more special construction. Several AP-markers are used with various imperfective, inceptive, frequentative or distributive readings; all of them lead to an intransitive verb morphologically, but preserve the original valency syntactically. The ergative-nominative pattern of a transitive verb gets shifted to a nominative-instrumental pattern. According to Beach (2003) there is an important difference between dative-marked agent phrases in the passive and instrumental-marked patient phrases in the antipassive. The latter can be associated with a floating quantifier (21b), and allow interclausal binding (22b), while the former resist those operations (21a,22a). This author concludes that the instrumental NP of the antipassive construction is a core argument, whereas the dative NP of the passive construction is a peripheral adjunct.

(21) Floating quantifiers in Inuktitut (Beach 2003)

- a. arnaq anguti-nut taku-ja -u -laur -tuq (*atuniit)
woman.ABS man -DAT.pl see -PASS.PRT-be-PAST-IND.3sg (*each)
‘The woman was seen by (*each of) the men.’
- b. anguti-nik aannia-tit -si -laur -tuq atuniit
man-INS.pl be.sick-CAUSE-AP-PAST-IND.3sg each
‘It made each of the men sick.’

(22) Interclausal binding in Inuktitut (Beach 2003)

- a. (*immi-nit) [Jaani-mut ulla-guma-na-raluar -ti -lu -gu] sukannisaqalaurtuq
self -ABL [John-DAT run-want-CAUSE-indeed-OBV-APPL-3s] there.was.someone.faster
‘Although it made John want to run, there was someone faster (*than self).’
- b. immi-nit [Jaani-mik ulla-guma-tit -si -galuar -ti -lu -gu] sukannisaqalaurtuq
self -ABL John-INS run-want-CAUSE-AP-although-OBV-APPL -3s] there.was.someone.faster
‘Although he/she/it made John_i want to run, there was someone faster than him_i.’

Moreover, the Eskimo antipassive construction is associated with semantic readings that are not usually attributed with antipassive. As Bittner (1987) showed, the instrumental NP in the antipassive needs neither to be indefinite nor unspecific, in the contrary it can be realized with proper nouns as well as with demonstratives. On the other hand, the nominative subject could also be indefinite or unspecific, so that in this respect a contrast between the two arguments is not necessary. According to Bittner, the various semantic effects of the antipassive construction rather follow from considering it in the context of an operator such as negation, quantifier, tense, modality, or distributive plural. Unlike the nominative object-NP of the plain transitive clause, the corresponding instrumental NP of the antipassive is permitted with narrow scope, and it receives

that reading preferably if the construction is contrasted with the plain transitive; moreover it can be inferred that the instrumental NP acquires an indefinite or unspecific reading more easily. (SEQ) to (25) show some of Bittner's examples. The a-sentences are transitive and only allow the wide scope reading A, whereas the b-sentences are antipassivized and in addition allow the narrow scope reading B. The notation is Bittner's.

- (23) Narrow scope readings of Greenlandic antipassive (Bittner 1987)
- a. *arnaq franskig angirlaat-tar-pa-a.* = A, *B
 woman.NOM French.NOM [come.home.with]- HAB-TR.INDIC-3sgE/3sgN
- b. [*arnaq-mik franskig-mik angirlaat-(ss)i]-tar-pu-q.* = A, B
 [woman-INS French-INS come.home.with-AP]-HAB-TR.INDIC-3sgN
 'He often comes home with French woman.'
 A. It's always the same woman.
 B. Different women on different occasions.
 A. $\exists x[x \text{ is a French woman \& often (he comes home with } x)]$
 B. *often* ($\exists x[x \text{ is a French woman \& he comes home with } x]$)
- (24) a. *ullut tamaasa irinarsurtuq tusar-pa-a.* = A, *B
 days all singer.NOM [hear]- TR.INDIC-3sgE/3sgN
- b. *ullut tamaasa irinarsurtuq-mik tusar-si-pu-q.* = A, B
 days all [singer-INS hear-AP]-INTR.INDIC-3sgN
 'Every day he hears singer.'
 A. Same singer every day.
 B. Different singers on different days.
 A. $\exists x[x \text{ is a singer \& every day (he hears } x)]$
 B. *every day* ($\exists x[x \text{ is a singer \& he hears } x]$)
- (25) a. *cigaretti [ikit]-pa-at* = A, *B
 cigarette.NOM [light]-TR.INDIC-3plE/3sgN
- b. [*cigaretti-mik ikit-si]-ppu-t* = A, B
 [cigarette-INS light-AP]-INTR.INDIC-3plN
 'They lit cigarette.'
 A. What they lit was just one cigarette for the whole group.
 B. They lit a cigarette each.
 A. $\exists x(x \text{ is a cigarette \& they1 [1 DIS [2 lit(2, } x)])]$
 B. they1 [1 DIS [2 $\exists x(x \text{ is a cigarette \& lit(2, } x))]$]

Inspired by these findings, Bittner detected similar effects of alternations in Basque, Polish, and Finnish, and came to the conclusion in (26). It tries to give a purely semantic explanation for the need of argument structure alternations, and at the same time it is general enough to cover various phenomena.

- (26) *The Scope Generalization (Bittner 1987)*
 If an argument can be expressed either by an NP in the case predicted by the parameter settings for the language or by some other kind of phrase, then the parametric alternant will obligatorily take wide scope with respect to sentential operators, such as negation, tense, aspect, modals, distributive operators, etc., while the nonparametric alternant will be permitted to take scope under these operators. It may in fact be restricted to take narrow scope.

Another argument reduction operation is the lexical reflexive. It establishes an anaphoric relationship by identifying a lower argument with the highest one. Such an operation is distinct from using a reflexive anaphora (such as *themselves*) in the syntax.

- (27) REFL [$\lambda z \dots \lambda x \text{ VERB}(x, \dots, z)$] = $\lambda x \text{ VERB}(x, \dots, x)$

(28a) shows the canonical case, in which a transitive verb is detransitivized. In (28b) however, the verb remains transitive; in this case a possessor is added to the core arguments (which makes the verb ditransitive) and is then identified with the highest argument. In general, reciprocal functions similarly, but has a more complex semantics (Heim et al. 1991, Williams 1991): the antecedent X must be plural and must receive a distributed interpretation, and any $x \in X$ is paired with some (or every) $y \in X$, where $y \neq x$. Interestingly, (28c) illustrates a case in which the reciprocal morpheme must be combined with the reflexive in order to unfold its full semantics.

- (28) Reflexive and Reciprocal in Bolivian Quechua (van de Kerke 1996: 160, 146)
- a. Pedru maylla-ku-n
P wash-REFL-3sg
‘Pedro washes himself.’
 $\text{REFL}[\lambda x \lambda x \text{WASH}(x,y)] = \lambda x \text{WASH}(x,x)$
 - b. Pedru uya-n-ta maylla-ku-n
P face-3sg-ACC wash-REFL-3sg
‘Pedro washes his (own) face.’
 $\text{REFL}[\lambda z \lambda y \lambda x \{ \text{WASH}(x,z) \ \& \ \text{POSS}(y,z) \}] = \lambda z \lambda x \{ \text{WASH}(x,z) \ \& \ \text{POSS}(x,z) \}$
 - c. maylla-na-ku-yku
wash-REC-REFL-1pl
‘We wash each other.’

Incorporation is quite a distinct type of argument reduction; in this case, an argument is realized as morphologically integrated nominal predicate. For instance, a noun can be prefixed to the verb stem, which indicates that this noun predicates of the lowest argument of the verb. Van Geenhoven (1998) analysed incorporated nouns as predicative indefinites. Formally, one can assume an operation that takes two elements in the input, a noun and a verb, and produces a coherent verb reading by argument identification.

- (29) $\text{INCORP} \langle \lambda v \text{NOUN}(v), \lambda z \dots \text{VERB}(\dots, z) \rangle = \exists z \dots \{ \text{VERB}(\dots, z) \ \& \ \text{NOUN}(z) \}$

This analysis suggests that noun incorporation always leads to a general or unspecific reading; however, some languages also allow a specific reading of the incorporated noun, as in (30a), where a demonstrative is stranded. Its referent has to be identified with the entity the complex N-V predicate is predicating of (30b).

- (30) Noun incorporation with definite reading in Southern Tiwa (Baker 1988: 93)
- a. Yede a-seuan-mu-ban.
that 2sg-man-see-PAST
‘You saw that man.’
 - b. $R(\text{‘that’}) = \iota z \{ \text{SEE}(\text{you},z) \ \& \ \text{MAN}(z) \}$.

Noun incorporation cannot be iterated, and only the lowest argument can be incorporated – probably because canonical λ -application takes place, affecting the lowest θ -role first. Noun incorporation makes it possible that other arguments than the lowest one can function as structural object (or even as subject): a recipient (31a), an instrument (31b), a possessor (31c,d), or a goal (31e). A ditransitive verb is transitivized in (31a), and a transitive verb is detransitivized in (31b,c), but then either undergoes instrumental applicative (see next section) or inherits the possessor from the incorporated possessed noun, and thus again shows a transitive construction. Similarly, an intransitive verb again becomes intransitive when it undergoes applicative (31e) or inherits the possessor (31d). The bracketing in the semantic representations shows the respective ordering of operations.

- (31) Noun incorporation (Baker 1988)
- a. Ka-‘u’u-wia-ban. *Southern Tiwa*
 1sg/2sg-baby-give-PAST
 ‘I gave you the baby.’
 $\lambda y \lambda x \exists z \{(\text{ACT}(x) \ \& \ \text{BEC POSS}(y,z)) \ \& \ \text{BABY}(z)\}$
- b. Kua ta fakatino he tama e malala. *Niue (Polynesian)*
 PERF-draw-picture ERG-child NOM-charcoal
 ‘The child has been drawing pictures with a charcoal.’
 $\lambda z \lambda x \{\exists y (\text{DRAW}(x,y) \ \& \ \text{PICTURE}(y)) \ \& \ \text{INST}(z)\}$
- c. Wa-hi-nuhs-ahni:nu: John. *Oneida*
 PAST-1sg/3m-house-buy John
 ‘I bought John’s house.’
 $\lambda z \lambda x \exists y \{\text{BUY}(x,y) \ \& \ (\text{HOUSE}(y) \ \& \ \text{POSS}(z,y))\}$
- d. Hrao-nuhs-rakv ne sawatis. *Mohawk*
 3m-house-white John
 ‘John’s house is white.’
 $\lambda y \exists x \{\text{WHITE}(x) \ \& \ (\text{HOUSE}(x) \ \& \ \text{POSS}(y,x))\}$
- e. Am-seuan-wan-ban liora-n. *Southern Tiwa*
 3pl-man-come-PAST lady-pl
 ‘The man came to the ladies.’
 $\lambda y \{\exists x (\text{COME}(x) \ \& \ \text{MAN}(x)) \ \& \ \text{GOAL}(y)\}$

3. Argument extension: Causative, Applicative, Resultative, and others

The opposite of argument reduction is argument extension: valency-increasing operations extend the number of syntactically active arguments. Argument reduction always binds an existing argument, so that the semantic core can remain unaffected. An additional argument, however, needs to be licensed by an additional predicate; therefore, argument extension always affects the semantic core itself. Either a higher predicate together with a higher argument is added, or a lower predicate together with a lower argument. A prototypical instance of the former type of operation is the causative, whereas various variants of applicative are characteristic for the latter type of operations.

The causative adds a causer, who instigates the event expressed by the basic verb, either by direct coercion, or more indirectly by giving an order or admitting a certain course of affairs. Some version of causative is found in nearly every language, and many languages have more than one type of causative (differing morphosyntactically and often also in their more finer semantic aspects). It is disputed in the literature whether the causative has to be represented explicitly by the predicate CAUSE (and whether this CAUSE is a relation between two events or between an entity and an event), or whether the causal relationship can be inferred from the lexical combination of an action predicate with another, more simple predicate (see, e.g., the different answers by Bierwisch 2002 vs. Wunderlich 2000, 2006). For the purpose of this article, I use the notion $\&_{\text{CAUSE}}$, taken as a contextually-induced reading of the connector AND. Moreover, the causative usually gets a factive reading, which is expressed by existential binding of the verb’s original event variable.

$$(32) \text{ CAUS } [\lambda s' \text{ VERB}(\dots)(s')] = \dots \lambda x \lambda s \{ \text{ACT}(x) \ \&_{\text{CAUSE}} \exists s' \text{ VERB}(\dots)(s') \} (s)$$

In a typical causative formed from a transitive verb the causee becomes the medial argument; it is marked dative in an accusative language such as Japanese (see below (38a)), as well as in an ergative language such as Basque (33).

- (33) Causative in Basque
- Ama-k haurr-a-ri zopa jan-eraz-i dio.
 mother-ERG child-DET-DAT soup.NOM eat-CAUS-PERF have.3N.3sgD.3sgE
 ‘Mother let the child eat the soup’
 $\lambda z \lambda y \lambda x \lambda s \{ \text{ACT}(x) \ \&_{\text{CAUSE}} \exists s' \text{ EAT}(y,z)(s') \} (s)$

In a double object construction the causee is realized as the primary object (can become the subject under passive, can be co-indexed with an object affix, etc.). Besides this unmarked option, illustrated in (34a), there is also a marked option, in which the causee is obliquely realized and does not function as a structural object (34b). Such a marked option is found in various languages, even in those that otherwise have a dative; in Hungarian, e.g., it can be captured by the assumption that the causative morpheme lexically assigns instrumental case (35b) (Wunderlich 2002).

- (34) Causative variation in Bantu: Chimwiini (a) vs. Chichewa-A (b) (Baker 1988: 183,163)
- a. Mwa:limu Ø-wa-andik-ish-ize wa:na xati.
 teacher SU-OB-write-CAUS-ASP children letter
 ‘The teacher made the children write a letter.’
- b. Anyani a-na-wa-meny-ets-a ana kwa buluzi.
 baboons SU-PAST-OB-hit-CAUS-ASP children to lizard
 ‘The baboons made the lizard hit the children.’
- (35) Medial arguments in Hungarian
- a. Anna Péter-nek adott egy könyv-et.
 A. P.-DAT gave a book-ACC
 ‘Anna gave a book to Peter.’
- b. Anna könyv-et olvas-tat Péter-rel.
 A. book-ACC read-CAUS P.-INST
 ‘Anna has Peter read a book.’

Another possible variant of the causative is object control, as found in causative verbs like *force* or *let* (*force him to go*, *let him go*). Such a verb adds two arguments, and moreover identifies its object with the subject of a dependent (infinitive) clause (36a). For a morphological operation, however, it would be bizarre to be so complex if a more simple alternative is available (36b).

- (36) Object control vs. causative (simplified)
- a. $\lambda P \lambda y \lambda x \text{FORCE}(x,y,P(y))$
- b. $\lambda p \lambda x \text{CAUSE}(x,p)$

A few languages have operations that add a highest argument in a function distinct from causer. One such operation is the assistive in Quechua, another one the affective in Japanese. (37) shows that causative and assistive are structurally alike in Quechua: either a causer or a helper is added as the highest argument. (Quechua lacks a dative, therefore all objects are realized by accusative; object agreement on the verb refers to the highest object, which is the causee in this case.) Similarly, causative and affective are structurally alike in Japanese (38a,b). Although the affective is formed with the same suffix (*-are*) as the passive and therefore traditionally called ‘indirect passive’, its argument structure is clearly distinct from that of the passive (38c). (Note that *-ni* functions both as dative and as adverbial postposition.)

- (37) Causative and Assistive in Bolivian Quechua (van de Kerke 1996:153, 157)
- a. mama-y Maria-ta maylla-chi-wa-rqa
 mother-1sg Mary-ACC wash-CAUS-1A-PAST
 ‘My mother made me wash Maria.’
 $\lambda z \lambda y \lambda x \lambda s \{ \text{CAUSER}(x) \ \& \ \text{WASH}(y,z) \} (s)$
- b. mama-y Maria-ta maylla-ysi-wa-rqa
 mother-1sg Mary-ACC wash-ASS-1A-PAST
 ‘My mother helped me to wash Maria.’
 $\lambda z \lambda y \lambda x \lambda s \{ \text{HELPER}(x) \ \& \ \text{WASH}(y,z) \} (s)$
- (38) Causative, affective and passive in Japanese (Washio 1995: 6)
- a. John-ga Mary-ni tokei-o nusum-ase-ta.
 John-NOM Mary-DAT watch-ACC steal-CAUS-PAST
 ‘John let Mary steal a watch.’
 $\lambda y \lambda x \lambda u \lambda s \{ \text{ACT}(u) \ \& \ \text{STEAL}(x,y) \} (s)$

- b. John-ga Mary-ni tokei-o nusum-are-ta.
 John-NOM Mary-DAT watch-ACC steal-AFF-PAST
 ‘John had a watch stolen by Mary.’
 = ‘John was affected by Mary stealing (his) watch.’
 $\lambda y \lambda x \lambda u \lambda s \{ \text{AFF}(u) \ \& \ \text{STEAL}(x,y) \} (s)$
- c. Tokei-ga Mary-ni nusum-are-ta.
 watch-NOM Mary-BY steal-PASS-PAST
 ‘The watch was stolen by Mary.’
 $\lambda y \lambda s \exists x \text{ STEAL}(x,y) (s)$

Regarding operations that add a non-highest argument, the term ‘applicative’ is used as a collective name; the added argument can be a recipient/beneficiary, a possessor, a location, or an instrument. In some languages, a single morpheme encodes all these extensions, while other languages have several distinct morphemes. The general scheme of applicatives when applied to a transitive verb is given in (39).

- (39) APPL [VERB(x,y)] = VERB(x,y) & POSS(z,y) ‘z is or becomes a possessor of y’
 & LOC(y AT z) ‘y is or becomes located at z’
 & INST(z,y) ‘z operates as an instrument on y’

In principle, the operation is possible with ditransitive verbs, too. Locative and instrumental applicatives mostly also apply on intransitive verbs; they then characterize a relation to the intransitive subject, or just a further participant of the event. Applied objects can also stand in a manner, comitative or sociative relation. In any case, the subject remains the same, while an object is added and therefore the realization of objects is shifted. In that sense one can say that *enter* (‘x goes-and-becomes-located-at y’) is a local applicative of *go* (‘x goes’), although the relation *enter-go* is formally a suppletion.

The most prototypical instance of applicative is the benefactive alternation, shown in (40); here, the transitive verb ‘buy’ becomes ditransitive by means of the applicative suffix in (40b). Following Baker (1988), one might say that the preposition ‘for’ is incorporated into the verb, so that the prepositional object becomes a direct argument of the verb. However, since *untuk* ‘for’ and the applicative *kan* are quite distinct morphemes, ‘incorporation’ had to be understood in a rather abstract sense. Conceptually it is more convenient to consider the applicative as a way of expressing further participants, independently of whether corresponding prepositional means exist. Thus, the relationship between (40a) and (40b) is purely semantical, not generative.

- (40) Benefactive alternation in Bahasa Indonesia (Chung 1976)
- a. Ali memi telefisi untuk ibu-nja.
 Ali TR.buy televison for mother-his
 ‘Ali bought a televison for his mother.’
- b. Ali mem-beli-kan ibu-nja telefisi.
 Ali TR-buy-APPL mother-his televison
 ‘Ali bought his mother a televison.’

A similar argumentation holds for the locative alternation as described for English, German, or Hungarian. The semantically related sentences in (41a,b) and (42a,b) can be assumed to be base-generated rather than derived from each other. (This does not exclude that one might actually find preposition incorporation in instances like (43).) It has often been observed that there are finer semantic differences between the respective a- and b-sentences, which follow from the different status of the arguments involved. The a-sentences are preferred if one wants to communicate that all parts of the stuff (hay, paint) were located somewhere, whereas the b-sentences are preferred if all parts of a location were occupied by the stuff. The question, however, why ‘hay’ in (42b) and ‘paint’ in (41b) cannot be expressed as structural arguments, cannot be discussed here, but see Wunderlich 1997.

- (41) Locative alternation in Hungarian (Ackermann 1992)
- a. a paraszt (rá-)rakta a szénát a szekérre.
the peasant (onto-)loaded.3sg.DEF the hay.ACC the wagon.SUBL
'The peasant loaded the hay onto the wagon.'
- b. a paraszt meg-rakta a szekeret (szénával).
the peasant PERF-loaded.3sg.DEF the wagon.ACC (hay.INSTR)
'The peasant loaded the wagon (with hay).'
- (42) Locative alternation in German (Brinkmann 1995)
- a. Die Vandalen spritzten Farbe auf das Auto.
the vandals sprayed paint onto the car
- b. Die Vandalen be-spritzten das Auto (mit Farbe).
the vandals BE-sprayed the car (with paint)
- (43) Preposition incorporation in German
- a. Sie flogen über die Ostsee.
they flew over the Baltic.
- a. Sie über-flogen die Ostsee.
they over-flew the Baltic.

The examples (44a-c) illustrate some variants of applicative in the Bantu language Kinyarwanda; benefactive, possessor-raising, and instrumental applicative are marked by different suffixes. As one can see, *-iish* is ambiguous; it either marks instrumental applicative or causative. The respective reading depends on the sortal properties of the complements: usually a child but not a piece of soap is washed, while soap but not a child can be an instrument of washing.

- (44) Applicatives in Kinyarwanda (Polinsky and Kozinsky 1992)
- a. umugóre y-a-som-e-ye umwáana igitabo.
woman 3sg-PAST-read-APPL-PERF child book
'The woman read the book to the child.' *benefactive applicative*
- b. umugabo a-ra-kikir-ir-a umugóre umwáana.
man 3sg-PRES-hold-APPL-IMPF woman child
'The man is holding the woman's child.' *possessor-raising applicative*
- c. umugóre y-Ø-uhag-iish-ije umwáana isábune.
woman 3sg-PAST-wash-APPL-PERF child soap
'The woman washed the child with soap.' *instrumental applicative*
- d. umugóre y-Ø-uhag-iish-ije umukoóbwa umwáana.
woman 3sg-PAST-wash-CAUS-PERF girl child
'The woman made the girl wash the child.' *causative*

A further type of argument extension on the lower end of the argument hierarchy is the strong resultative, by which both an object and a predicate are added to the verb. As the examples (45a,b) show, the object is only licensed by the result predicate, not by the verb itself. (45c) shows the general templatic operation.

- (45) Strong resultatives
- a. Paul ran the lawn flat. (*Paul run the lawn)
RUN (paul) & BECOME FLAT(the.lawn)
- b. Paul drank the fridge empty. (*Paul drank the fridge)
∃y DRINK(paul,y) & BECOME EMPTY(the.fridge)
- c. RES [VERB(...)] = {VERB(...) &_{CAUSE} RESULT(z)}, where RESULT is a predicate variable.

In comparison with causatives, which are usually encoded by a generalized morpheme leaving the causing action unspecified, it is interesting to note that resultatives are rarely encoded by a generalized morpheme, but mostly by the presence of a predicate that specifies the result. This

might be predicted by a general cognitive principle “A causal action can remain unspecific, but a result must be specified”. In any case, resultatives, although they add a lower argument as well, crucially differ from applicatives. The only generalized resultative marker I am aware of is Chinese *de*, derived from the verb ‘obtain’, which is used in a verbal compound as in (46).

(46) Chinese *de*-construction

- a. Ta ku-**de** shoujuan quan shi le.
 he cry-DE handkerchief all wet FIN
 lit. ‘He cried such that the handkerchief got all wet’
 ‘He cried the handkerchief all wet.’
- b. Lisi zhui-**de** Zhangsan hen lei.
 L chase-DE Z very tired
 lit. ‘Lisi chased somebody and [as a result] Zhangsan got very tired’
 ‘Lisi chased Zhangsan very tired.’

There are, however, more specific markers of resultativity, e.g. prefixes or particles in a language like German. In (47), the prefix *er-* contributes the result predicate POSS.

(47) German prefix verbs (Stiebels 1996)

- a. Sie er-schrieb sich den Pulitzer-Preis.
 She **er-**wrote herself the Pulitzer price.
 ‘She won the Pulitzer price by her writing’
- b. $\lambda_V \lambda_u \lambda_x \lambda_s \exists y \{ \text{WRITE}(x,y) \ \&_{\text{CAUSE}} \ \text{BECOME POSS}(u,v) \} (s)$
 y becomes non-structural here and cannot be realized as a complement
 (Wunderlich 1997).

4. Functor vs. incorporation

Derivational morphemes such as causative and applicative are usually considered morphological heads; they apply on a verb in order to form a more complex verb. If the Kinyarwanda suffix *-iish* is ambiguous between causative and applicative, there is certainly no difference in the headedness status between causatives and applicatives. However, as outlined above, the causative adds a new highest argument, while the applicative adds a non-highest argument; therefore, they must have a different status in functional composition. I take it for granted that the functor in a derivation contributes the highest argument. Thus, the causative morpheme is a functor that takes the verb, however, in virtue of the same logic, the applicative morpheme cannot be the functor. Hence, in this case the verb itself must be the functor, but it has to undergo a templatic predicate extension in order to incorporate a further predicate.

(48a,b) repeats the pair of sentences (44d,c) from above, and adds a benefactive formed from the same verb. Let (49a) represent the causative reading of *-iish*, and (49b) the verb ‘wash’. Then, (49c) derives via functional composition; a highest argument is added, and all original arguments of the verb are inherited.

(48) Causative, instrumental, and benefactive applicative in Kinyarwanda

- a. umugóre y-Ø-uhag-iish-ije umukoóbwa umwáana.
 woman 3sg-PAST-wash-CAUS-PERF girl child
 ‘The woman made the girl wash the child.’
- b. umugóre y-Ø-uhag-iish-ije umwáana isábune.
 woman 3sg-PAST-wash-APPL-PERF child soap
 ‘The woman washed the child with soap.’
- c. umugóre y-Ø-uhag-e-ye umukoóbwa umwáana.
 woman 3sg-PAST-wash-APPL-PERF girl child
 ‘The woman washed the child for the girl.’

(49) The causative as a functor on the verb

- a. causative *-iish*: $\lambda_V \lambda_u \lambda_s \{ \text{ACT}(u) \ \& \ \exists s' \ V(s') \} (s)$
- b. *uhag*: $V = \lambda_y \lambda_x \lambda_s \text{WASH}(x,y)(s)$

- c. *uhag-iish*: $\lambda y \lambda x \lambda u \lambda s \{ \text{ACT}(u) \ \& \ \exists s' \ \text{WASH}(x,y)(s') \} (s)$

In order to derive the semantic representations of (48b,c), the verb must function as functor. For this purpose, the verb undergoes the templatic extension shown in (50), incorporating the predicate P, whatever it is.

- (50) Predicate incorporation into a verb:
P-INCORP $\langle P, \dots \lambda s \text{ VERB}(\dots)(s) \rangle = \lambda P \dots \lambda s \{ \text{VERB}(\dots)(s) \ \& \ P(s) \}$,
 which can be simplified as $\{ \text{VERB}(\dots) \ \& \ P \} (s)$

Let us assume that the verb ‘wash’ is augmented in this way (51a), and that P is instantiated by an instrumental predicate (51b), then (51c) is derived via functional composition. Here, the original arguments of the verb remain the highest ones, whereas those of the incorporated predicate become lower ones. If one wants the complex situation expressed by the derived verb to be coherent, incorporans and incorporandum should share an argument. In principle, v can be identified with either s or y (with slightly different readings: ‘instrument of performing an action’, ‘instrument operating on an individual entity’), but certainly not with x. This yields one of the representations given in (51d); the difference is that the instrumental object is either the lowest or the medial argument of the complex verb. When combined with a transitive verb, the applied instrumental object (u) in the Bantu languages indeed sometimes has properties of the lowest, and sometimes of a medial argument.

- (51) The (extended) verb as functor on the applicative
 a. P-INCORP(*uhag*): $\lambda P \lambda y \lambda x \lambda s \{ \text{WASH}(x,y) \ \& \ P \} (s)$
 b. applicative *-iish*: $\lambda v \lambda u \text{ INSTR}(u,v)$
 c. *uhag-iish*: $\lambda v \lambda u \lambda y \lambda x \lambda s \{ \text{WASH}(x,y) \ \& \ \text{INSTR}(u,v) \} (s)$
 d. $\lambda u \lambda y \lambda x \lambda s \{ \text{WASH}(x,y) \ \& \ \text{INSTR}(u) \} (s)$
 $\lambda y \lambda u \lambda x \lambda s \{ \text{WASH}(x,y) \ \& \ \text{INSTR}(u,y) \} (s)$

In contrast, the applied beneficiary mostly shows properties of the medial argument, and the applied locative object shows properties of the lowest argument (Alsina and Mchombo 1990). This is expected, given that the predicate that integrates beneficiaries is assumed to be POSS(u,v), with u being the applied object, whereas the predicate in the case of locative application is LOC(v, AT u), again with u being the applied object.

Of course, one could think of representing the causative and applicative morphemes more similar to each other, e.g. as {CAUSER(u) & VERB} vs. {VERB & INSTR(u)}, but in that case the actual hierarchy of arguments is not determined by functional composition, so it must be determined by additional, independent means.

In the German prefix verbs, the verb is both the head and the functor. (52a) repeats (47a) from above. (52b) shows the verb extended by P-INCORP, and (52c) the semantic contribution of the prefix *er-*. Functional composition then yields the result in (52d). As a matter of fact, the document written (y) cannot be expressed because y neither is in the position of a structural argument (Wunderlich 1997b) nor can be identified with the thing to become possessed (v); therefore it must be bound existentially.

- (52) German prefix verbs (Stiebels 1996)
 a. Sie *er*-schrieb sich den Pulitzer-Preis.
 She *er*-wrote herself the Pulitzer price.
 ‘She won the Pulitzer price by her writing’
 b. P-INCORP(*schreib*): $\lambda P \lambda y \lambda x \lambda s \{ \text{WRITE}(x,y) \ \& \ P \} (s)$
 c. resultative *er-*: $\lambda v \lambda u \text{ BECOME POSS}(u,v)$
 d. *er-schreib*: $\lambda v \lambda u \lambda y \lambda x \lambda s \{ \text{WRITE}(x,y) \ \& \ \text{BECOME POSS}(u,v) \} (s)$
 $\Rightarrow \lambda y \lambda u \lambda x \exists y \{ \text{WRITE}(x,y) \ \& \ \text{BECOME POSS}(u,v) \} (s)$

The representation (52d) is still unsatisfactory because it doesn’t make explicit the difference between a factual and an intended result. If I write Paul a novel I intend Paul to become the

possessor of the novel ($\text{WRITE}(x,y) \ \&_{\text{INTEND}} \ \text{BECOME POSS}(u,y)$), however, if Paul then wins the Pulitzer price with this novel (pretending to have written the novel by himself) the sentence ‘Ich erschrieb Paul den Pulitzer-Preis’ becomes true. The minimal repair in (52d) would be ‘ $\&_{\text{CAUSE}}$ ’ instead of ‘ $\&$ ’, but this would require a slightly different incorporation template in the beginning.

5. Polyfunctional affixes

In the Pama-Nyungan languages of Australia one often finds a single affix functioning as a general transitivization marker. The Kalkatunga suffix *-nti*, e.g., adds a causer if it is combined with an inchoative or stative verb (53a), but it adds a beneficiary, instrument, or location if it is combined with an agentive verb (53b). In a subgroup of these languages the same affix can be applied on transitive verbs as well, but usually only when they have first been detransitivized by antipassive, as in (53c). (Note that antipassive demotes the object, visible here in the oblique dative marking.)

- (53) Transitivization in Kalkatunga (Austin 1997)
- | | | | |
|----|--------------------------------------|-------------|----------------------------------|
| a. | iti ‘return’ | | iti-nti ‘send/bring back’ |
| | nguyi ‘fall’ | | nguyi-nti ‘push over’ |
| b. | nuu ‘lie’ | | nu-nti ‘lie on (something)’ |
| | wani ‘play’ | | wani-nti ‘play with (something)’ |
| c. | Nga-thu | kati-nti-mi | tharntu kupangurru-u. |
| | 1-ERG | bury-TR-FUT | hole old.man-DAT |
| | ‘I will bury the old man in a hole.’ | | |

A canonical transitive verb can eventually be decomposed into an active (controller) and an affected predicate. Given that an intransitive verb instantiates either active or affected, the function of the transitivizing affix then is to derive a canonical verb, i.e. to add the respective complementary predicate.

- (54) $\text{TR} [\lambda y \text{ AFF}(y)] = \lambda y \lambda x \text{ ACT}(x) \ \& \ \text{AFF}(y)$
 $\text{TR} [\lambda x \text{ ACT}(x)] = \lambda y \lambda x \text{ ACT}(x) \ \& \ \text{AFF}(y)$

Different from *-nti* above is an affix that either transitivizes or detransitivizes, as, e.g., *-e* in Japanese. Comrie (2006) lists 57 inchoative/causative pairs in which *-e* derives the causative verb (55a), and 36 pairs in which it functions to the opposite, namely derives the inchoative verb from the transitive one (55b). Much larger is the number of pairs where both verbs are derived by different means (55c).

- (55) Causatives vs. anticausatives in Japanese (Comrie 2006)
- | | | |
|----|--------------------|----------------------------|
| a. | ak-u ‘open’ | ak-e-ru ‘open (tr.)’ |
| | itam-u ‘hurt’ | tam-e-ru ‘injure’ |
| | tat-u ‘stand’ | tat-e-ru ‘raise’ |
| b. | nuk-u ‘remove’ | nuk-e-ru ‘come off’ |
| | or-u ‘break (tr.)’ | or-e-ru ‘break’ |
| | tuka-u ‘use’ | tuka-e-ru (be usable) |
| c. | kowa-s-u ‘destroy’ | kowa-re-ru ‘be destroyed’. |

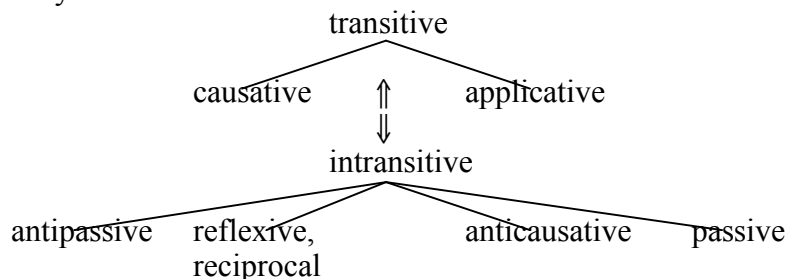
A similar phenomenon has been observed in other languages, too (Haspelmath 1993). In their majority, languages tend to use the causative operation more frequently than its opposite, called anticausative. Only the semitic languages show more anticausatives, using, however, a number of different prefixes. Formally, one can describe the function of Japanese *-e* as in (56). It is important to note that, unlike passive, the anticausative does not imply the presence of an agent.

- (56) $-\text{e} [\lambda y \text{ AFF}(y)] = \lambda y \lambda x \{ \text{ACT}(x) \ \& \ \text{AFF}(y) \}$
 $-\text{e} [\lambda y \lambda x \{ \text{ACT}(x) \ \& \ \text{AFF}(y) \}] = \lambda y \text{ AFF}(y)$

Obviously, the anticausative operation conflicts with the principle of monotonicity, stating that no semantic information is deleted in the course of derivation. Therefore it is hard to conceive of an affix to have emerged with a pure anticausative function; it would have been blocked by the above principle. What one indeed finds are morphemes with a broader function including as a special case the anticausative reading. One possibility is, within the inchoative/causative pairs, that a marker can choose either the more complex or the more simple item. Given a grammatical dimension in which pairs of lexical items derived from a common stem can be ordered, one member of the pair should have the semantic property X, while the other lacks it. Usually one expects pairs $\langle \sigma, \sigma' \rangle$ such that $\sigma = \langle \text{PF}, \text{SF} \rangle$ and $\sigma' = \langle \text{PF} + \text{pf}, \text{SF} + \text{sf} \rangle$, where $\langle \text{pf}, \text{sf} \rangle$ is the contribution of an affix or some other morphophonological operation. However, if a form expressing $\text{SF} + \text{sf}$ is more likely to be used than the alternative form expressing SF simpliciter it is conceivable that the more complex meaning is combined with the more simple PF, i.e., pairs $\langle \sigma, \sigma' \rangle$ such that $\sigma = \langle \text{PF}, \text{SF} + \text{sf} \rangle$ and $\sigma' = \langle \text{PF} + \text{pf}, \text{SF} \rangle$ might become possible as well. (Bidirectional optimality theory would be able to model such a situation, see Blutner and Zeevat 2004).

The other possibility is detransitivization as a multi-functional operation, which derives, depending on the specific meaning of the verb, several kinds of intransitive readings. The middle voice is typically known for its multiple readings. Unlike passive and antipassive as special operations for deactivating the higher or the lower argument (the agent or patient) respectively, the middle seems to be a general operation that basically contrasts intransitives (of any kind) to transitives. According to the diagram (57) one can distinguish general transitivizers and general detransitivizers from more specific operations. Above the more specific pair causative/ applicative was illustrated; it would be interesting to know whether other specific pairs such as antipassive/ applicative exist as well, and if not, why not.

(57) Transitivity alternations



Much more often than the fusion of causative and applicative in a single affix (see (53)) one finds a fusion of detransitivizing operations in a single affix. An extreme example of polyfunctionality is attested in Chukchi, where the suffix *-tku/-tko* not only functions as a general detransitivizer comprising anticausative, antipassive, reflexive, and reciprocal (58), but also derives both paucal ('island' → 'a group of islands') and iterative ('bite' → 'bite several times') readings; moreover, this affix also derives verbs from instrumental nouns ('rifle' → 'to shoot'), and functions as 1pl object marker in the presence of a 2nd person subject (*pela-tko-tək* leave-1pl-2pl 'you left us'); of course, some of the latter functions might be considered as accidental homonymy.

(58) Detransitivization in Chukchi (Nedjalkov 2006: 222)

- | | | |
|----|---|---|
| a. | <i>ejpə-nin</i> 'he closed it' | <i>ejpə-tku-γ³i</i> 'it closed' (<i>anticausative</i>) |
| b. | <i>ʔətt²-e juu-nin</i> 'the dog bit him' | <i>ʔətt²-ən nə-jγu-tku-qin</i> 'the dog bites' (<i>antipassive</i>) |
| c. | <i>tewla-nen</i> 'he shook it off' | <i>tewla-tko-γ³e</i> 'he shook himself' (<i>reflexive</i>) |
| d. | <i>ommačajpə-nen</i> 'he hugged him' | <i>ommačajpə-tko-γ³at</i> 'they hugged each other' (<i>reciprocal</i>) |

Thus, besides of all its other functions, *-tku/-tko* provides a whole set of detransitivizing operations.

(59) **-tku/-tko** [$\lambda y \lambda x (\text{ACT}(x) \ \& \ \text{AFF}(y))$] =
 $\{ \lambda y \text{AFF}(y), \lambda x \exists y (\text{ACT}(x) \ \& \ \text{AFF}(y)), \lambda x (\text{ACT}(x) \ \& \ \text{AFF}(x)), \dots \}$

In Kharia, a South Munda language, every predicate must be voice-marked for either middle or active (where voice is always fused with tense-mood). Numerous verbs are middle-only, numerous are active-only, and many more verbs allow both options. The verb gets inchoative reading in the middle, but causative reading in the active (60a). Furthermore, verbs that are independently marked for passive/reflexive require the middle (60b), and those that are marked for causative require the active (60c).

- (60) Middle/active pairs in Kharia (Peterson 2006)
- | | | | |
|----|--------|-------------------|---------------------------|
| a. | ayo | ‘become a mother’ | ‘accept s.o. as a mother’ |
| | khatam | ‘come to an end’ | ‘finish’ (TR) |
| | sebol | ‘become sweet’ | ‘make sweet’ |
| | tuta | ‘go down’ | ‘put down’ |
- b. yo dom-ki-kiyar.
see PASS/REFL-MIDDLE.PAST-DUAL
‘They two were seen (by someone else). / They two saw themselves.’
- c. yohan beta o-dam-e.
John boy CAUS-arrive-ACT.IRR
‘John will bring the boy.’

Besides some sorts of intransitivity, the middle characterizes habitual, persistent, self-directed, attempted (but not successful), spontaneous or unexpected actions, as well as those in which the subject participates only indirectly. As Peterson (2006) argues, the middle appears to mark those events which differ somewhat from prototypical actions, in contrast to the active, which marks events that are closer to prototypical actions.

Similarly, the middle voice of Greek, and the reflexive in Spanish, Russian, and other Indo-European languages of Europe are notoriously known for their multifunctionality, including the anticausative reading.

- (61) Spanish reflexives (Kaufmann 2004: 191)
- | | | | |
|----|------------------------------|-----------------------------------|-----------------|
| a. | Juan se lava. | ‘Juan washes himself.’ | (reflexive) |
| b. | La cuerda se rompe. | ‘The rope splits.’ | (anticausative) |
| c. | El libro se publicó en 1952. | ‘The book was published in 1952.’ | (passive) |
| d. | Se vive bien aquí. | ‘People live well here.’ | (impersonal) |
| d. | Estas frutas se comen. | ‘These fruits are eatable.’ | (modal) |

Kaufmann (2004) tried to find a general meaning of the middle affixes of Classical Greek and Fula from which the specific subreadings could follow as special contextual instances. Regardless of whether such a reconstruction succeeds for a number of readings, one must be sceptical whether such an enterprise is on the right track in general. Affixes (or clitics, as in Spanish) often seem to be a constructional device to make lexically items semantically related, without having a unique meaning.

Watters (2005) reports about Kusunda, a language isolate of Nepal, that a particular harmonic mutation on verbs marks the semantically more articulated category in a pair of categories, regardless of the particular dimension; so it marks causative in the transitivity dimension, irrealis in the modality dimension, negation in the polarity dimension, and dependent in the dependency dimension. Thus, a single phonological feature (mutation) is paired with semantic markedness, whereas the concrete semantic operation has to be chosen from a set of alternatives.

6. Iterated operations, order of derivation

Operations on argument structure can be combined cyclically, so that the output of a first operation serves as the input for a further operation. In particular, argument reduction and argument extension often alternate. Yucatec Maya illustrates a type of language in which no more than two structural arguments are possible; in a certain state of affairs a verb can either be transitivized or detransitivized. More precisely, causative (suffixation of -s) or applicative (suffixation of -t) apply

on verbs in an intransitive state, whereas passive, antipassive or noun incorporation apply on verbs in a transitive state. These operations can easily be combined. (62a) shows the ordering V-CAUS-PASS, (62b) V-APPL-PASS, (62c) V-PASS-CAUS-PASS, and finally (62d) V-INCORP-APPL. The respective last lines indicate the semantic representation of the complex verb.

(62) Alternation of transitivization and intransitivization in Yucatec Maya (Krämer and Wunderlich 1999)

- a. kíin-s-áab-en tumèen leti
 die-CAUS-PASS.PERF-1 PREP PRON.3.SG
 ‘I was killed by him.’
 $\lambda y \lambda s \exists x \{ACT(x) \& DIE(y)\}(s)$
- b. k=a kóoy-t-áal
 INCOMPL=2 dig -APPL-PASS.IMPF
 ‘It gets dug (up).’
 $\lambda y \lambda s \exists x \{DIG(x) \& AFFECTED(y)\}(s)$
- c. k=u káan-s-áal
 INCOMPL=3 learn.PASS-CAUS-PASS.IMPF
 ‘it is being taught’
 $\lambda z \lambda s \exists x \{ACT(x) \& \exists y LEARN(y,z)\}(s)$
- d. taan=u kon-lol -t -ik -et
 INCOMPL=3 sell-flower-APPL-IMP-2
 ‘He’s selling you flowers.’ (lit. ‘he’s flower-selling you’)
 $\lambda y \lambda x \lambda s \{\exists z (SELL(x,z) \& FLOWER(z)) \& AFFECTED(y)\}(s)$

Many more languages supply evidence that argument changing operations can be combined freely, though they may be subject to some sequential constraints. (63a) gives an example from Chichewa with the ordering V-APPL-REC-CAUS. (63b) shows the stepwise semantic derivation; the symbol \oplus indicates a reciprocal relationship between the two occurrences of a variable.

(63) Interaction of argument changing operations in Chichewa

- a. M-lenje a-na-mang-ir -an -its -a a-tsikana nkhuni.
 1-hunter 1-PAST-tie-APPL-REC-CAUS-FV 2-girl firewood
 ‘The hunter caused the girls to tie firewood for each other’
- b. *mang*: $\lambda y \lambda x \lambda s TIE(x,y)(s)$
mang-ir: $\lambda y \lambda z \lambda x \lambda s \{TIE(x,y) \& BEC POSS(z,y)\}(s)$ *Benefactive-Appl.*
mang-ir-an: $\lambda y \lambda x^{\oplus} \lambda s \{TIE(x,y) \& BEC POSS(x,y)\}(s)$ *Reciprocal*
mang-ir-an-its: $\lambda y \lambda x^{\oplus} \lambda u \lambda s \{ACT(u) \& \exists s' \{TIE(x,y) \& BEC POSS(x,y)\}(s')\}(s)$ *Causative*

One can easily imagine that any other order of affixes would yield a different interpretation:

- REC-CAUS-APPL: ‘The hunter caused the girls to tie each other at the firewood’;
- CAUS-REC-APPL: ‘The hunters caused each other to tie firewood for the girls’.

However, some surface orders of suffixes are forbidden. According to Hyman and Mchombo (1992), the causative suffix *-its* may not appear after the applicative suffix *-ir* or the passive suffix *-idw*. In other words, the affix ordering is fixed, independently of semantic scope.

(64) Surface alignment constraints in Chichewa

- a. *-ir-its (-APPL-CAUS)
 b. *-idw-its (-PASS-CAUS)

That the first constraint leads to ambiguity, which in a normal context, however, can be resolved, is shown in (65). In (65a), the applicative instrument ‘sticks’ is used for causation, not for the crying, whereas in (65b) the applicative instrument ‘spoon’ clearly relates to the lower verb ‘stir’. (Interestingly, the passive of (65a) requires ‘sticks’ as the subject, and the passive of (65b) requires ‘woman’ as the subject, thus reflecting the different semantic scope.)

- (65) Chichewa CAUS-APPL representing both scopes (Hyman 2003)
- a. alenjé a-ku-líl-**its-il**-a waná ndodo.
 hunters 3pl-PROG-cry-CAUS-APPL-FV child sticks
 ‘The hunters are making the child cry with sticks.’ (with (cause cry))
- b. alenjé a-ku-tákás-**its-il**-a mkází mthíko.
 hunters 3pl-PROG-stir-CAUS-APPL-FV woman spoon
 ‘The hunters are making the woman stir with a spoon.’ (cause (stir with))

Similar ambiguity is caused by the second constraint: TIE-PASS-CAUS ‘u causes y to be tied’ and TIE-CAUS-PASS ‘x is caused to tie y’ clearly mean different things, that is, two different semantic compositions are mapped onto the same surface string *mang-its-idw-a*. Unless there is a strong contextual bias to the contrary, the transparent reading in which the order of suffixes reflects the order of semantic operations should be assumed the default option for the hearer. Another type of mismatch found in Chichewa is semantically empty suffix repetition. In (66), the second occurrence of the reciprocal suffix *-an* has to be ignored because the semantic reciprocal operation cannot be repeated in the same domain.

- (66) Redundancy in Chichewa:
 A-tsikana a-na-mang-an **-its -idw -ir -an -a** m-nkhalango.
 2-girl 2-PAST-tie-REC-CAUS-PASS-APPL-(REC)-FV LOC-forest
 ‘The girls were caused to tie each other in the forest’

Similarly, double or triple causative found in languages of India often only means emphasized causative, e.g., Kashmiri *khy-aav-inaav* ‘eat-CAUS-CAUS’ and *khy-aav-inaav-inaav* ‘eat-CAUS-CAUS-CAUS’ both mean ‘have someone feed someone’. Many other studies (e.g., Muysken 1986 and van de Kerke 1996 on Quechua) have established the insight that the order of affixes reflects the order of semantic composition in most instances, unfortunately not in all. Surface alignment constraints partially destroy the ideal picture. Hyman (2003) argues that Proto-Bantu started with a fixed template (verb-CAUS-APPL-REC-PASS) of which many residuals are still present; he also cites from Abasheikh (1978), who found that Chimwiini (a Swahili dialect of Somalia) has a fixed affix ordering.

In order to see how constraints such as those in (64) are working parallel processing can be assumed: For each suffix (contributing a phonological form and a semantic operation), the phonological output PF and the semantic output SF are computed separately. Differences between the input and output in PF do not affect the output in SF. The derivation only fails if one of the parallel lines of processing yields a zero output.

- (67) Input: PF SF
- | | | | |
|----------|--------------|--|------------------|
| <i>a</i> | mang | $\lambda y \lambda x \lambda s$ TIE(x,y)(s) | |
| <i>b</i> | mang-idw | $\lambda y \exists x \lambda s$ TIE(x,x)(s) | <i>Passive</i> |
| <i>c</i> | mang-idw-its | $\lambda y \exists x \lambda u \lambda s \{ACT(u) \& \exists s' TIE(x,x)(s')\}(s)$ | <i>Causative</i> |
- ↓
- Output: *mang-its-idw*

According to (64b), the PF arrived at in line c is forbidden, so the second-to-best position of *-its* is chosen, that is, actually *-its* is infixal.

Stiebels (2003) distinguishes between transparent, restricted and opaque affix orders. If both affix orders occur and transparently reflect the underlying scope relations they are called transparent. If due to a language-specific constraint only one affix order occurs and receives a surface-true, i.e. compositional interpretation it is called restricted. If a given affix order has both the compositional and the non-compositional interpretation – the latter violating the Mirror Principle – it is called opaque.

- (68) Mirror Principle
- a. Morphological derivations must directly reflect syntactic derivations (and vice versa). (Baker 1985:375)
- b. The affix order must mirror semantic composition. (Stiebels 2003: 292)

All underlying predicates, together with all of their arguments, are in the scope of the following morphological operation. Different orders such as CAUS-REC vs. REC-CAUS generate different readings because they manipulate on argument *variables*, which are scope-internal and independent of any DP movement. If, in contrast, argument changing operations were phrasal, they would operate on VPs (rather than Vs), so that some arguments were already saturated, and DP movement could easily extract the DP from the relevant scope.

- (69) Morphologically determined scope relations are immune against DP movement, syntactically determined scope relations are not.

The following data from Wechsler (1989) show that only core arguments and not PPs are included in the scope of a bound morpheme. The participants of the repeated situation expressed in the Chichewa example (65a) include the writer and the essay, but not the instrument; in (65b), however, the instrument is included as well because the (instrumental) applicative has applied.

- (70) Chichewa repetitives (Wechsler 1989: 429)
- a. Mu-lembe=nso chimangirizo [ndi nthenga]_{PP}
 you-write=again essay with feather
 ‘you write the essay again, with a quill (this time)’
 AGAIN [$\lambda y \lambda x \lambda s$ WRITE(x,y)(s)] & INSTR(feather)
 - b. Mu-lembe-*re*=nso nthenga chimangirizo.
 you-write-APPL=again feather essay
 ‘you write the essay with a quill again’
 AGAIN [$\lambda y \lambda z \lambda x \lambda s$ WRITE(x,y) & INSTR(z,y)(s)]

Conversely, as the English examples in (71) show, the repetitive adverb can include the locative PP in its scope (71a), but the repetitive prefix cannot (71b). Only if the location is incorporated into the verb it is in the scope of the prefix *re-* (71c); recall that *enter* in fact is a locative applicative of English.

- (71) English repetitives
- a. John ran to the forest again.
 AGAIN (to the forest (run (John)))
 - b. * John reran to the forest.
 § to the forest (AGAIN (run (John)))
 - c. John reentered the forest.
 AGAIN (entered (John, the forest))

Summarizing, affix order reflects semantic composition transparently but may also be subject to unexpected alignment constraints. Affixes include core arguments in their scope, hence, morphology differs from syntax in its scopal properties.

7. Argument alternation through lexical marking

From the semantic point of view, lexical marking is a trivial operation on argument structure. In the history of the Germanic languages (English, German, Scandinavian, Icelandic), many verbs encoded dative-nominative (72a) shifted to nominative-accusative (72b) without any relevant semantic change.

- (72) Shift in lexical marking from Early New High German to Modern German
- a. Mir ahnte das.
 I.DAT anticipated that (NOM)
 - b. Ich ahnte das.
 I.NOM anticipated that (ACC)

The case-pattern shown in (72b) represents that of canonical transitive verbs, while the pattern shown in (72a) is a marked one, characteristic for experiencer verbs. In general, lexical marking

serves to classify verbs according to their inherent meaning, nevertheless it is a pure surface operation, which only affects subcategorization and not the semantic core. These lexical features (whatever they are, but see Wunderlich 2003) can be added or removed during historical development. Only if for a particular verb different states of lexical marking coexist, small meaning differences can emerge. It is important to note that lexical marking on the highest argument usually excludes passivization – verbs of the type (72a) cannot be passivized. However, (72b) allows passivization, at least in principle; *das wurde von niemandem geahnt*, the passive of ‘nobody anticipated that’, is fine.

8. Argument alternation: dative shift, and others

Another type of argument alternation comes about through a different choice between semantically similar core representations, and not by an operation. In the so-called dative shift of English a verb with a prepositional object (PO) is shifted to a verb with double object (DO).

- (73) PO-DO alternation in English
 a. Anna gave a photo to Max. (PO)
 b. Anna gave Max a photo. (DO)

A more precise investigation, however, provides evidence that the two alternative constructions are connected with slightly different semantic representations, to be spelled out as ‘change of location’ vs. ‘change of possession’, so that there can be no operation between them.

- (74) Semantic representation of the PO-DO alternation
 a. PO: $\lambda y \lambda z \lambda x \{ACT(x) \&_{CAUSE} BECOME LOC(z, AT y)\}$
 b. DO: $\lambda z \lambda y \lambda x \{ACT(x) \&_{CAUSE} BECOME POSS(y, z)\}$

These two representations crucially differ with respect to argument hierarchy: the recipient (=goal) is the medial argument in (74b), but the lowest one in (74a). This fact allows us to make some important predictions.

In the DO construction, the recipient (y) should behave consistently as the higher object: it can bind a reflexive theme, can license a negative polarity item (such as *any*), can be moved in multiple questions, etc., which is true according to the several tests applied by Larson (1988). In contrast, in the PO construction the recipient (y, construed as a goal) should behave consistently as the lower argument: it can be bound by a theme, cannot be moved in multiple questions, etc. Among others, a quantifier in the higher argument can bind the possessor of a lower argument, but not vice versa, as shown in (75).

- (75) Argument hierarchy in the PO vs. DO construction
 a. He gave every baby_i to its_i mother.
 *He gave her_i baby to every woman_i.
 b. He gave every woman_i her_i baby.
 *He gave its_i mother every baby_i.

Another prediction concerns harmonic alignment. In general, the construction in which the higher argument outranks the lower one in terms of saliency should be favored. It is thus expected that PO is preferred if the theme is more salient than the recipient, e.g., first or second person, animate, a pronoun, definite, specific, or the topic. Conversely, DO should be preferred if the recipient (rather than the theme) adopts one of these properties. This is indeed the case, as shown by Bresnan & Nikitina (2003). (76) illustrates the distribution of pronominal vs. NP arguments.

- (76) Saliency in the PO vs. DO construction
 a. They gave him to an old woman.
 ?They gave a crying baby to him.
 b. They gave him a crying baby.
 *They gave an old woman him.

Similar observations have been made regarding the alternation between serial verb (SV) construction and DO construction in West African languages. As for Fongbe, a Kwa language of Benin, the SV construction in (77) shows the ranking theme > recipient, while the DO construction in (78) shows the reverse ranking recipient > theme, due to the possibility for a quantifier to bind a possessor pronoun.

(77) Serial verb construction in Fongbe (Lefebvre & Brousseau 2001: 463)

- a. Ûn só fɔ̀tò̀d d̀òkpò̀d̀òkpò xlɛ fɔ̀tò̀ó'̀tɔ̀ t̀n.
 1sg take picture every show picture.owner GEN
 'I showed every picture to its owner.'
- b. *Ûn xlé fɔ̀tò̀d t̀n xlɛ mè d̀òkpò̀d̀òkpò
 1sg take picture GEN give person every
 * 'I showed his picture to every person.'

(78) Double object construction in Fongbe (Lefebvre & Brousseau 2001: 455)

- a. Ûn xlé mè d̀òkpò̀d̀òkpò fɔ̀tò̀d t̀n. (or: ... fɔ̀tò̀d t̀n mè d̀òkpò̀d̀òkpò)
 1sg show person every picture GEN
 'I showed every person his picture.'
- b. *Ûn xlé fɔ̀tò̀d d̀òkpò̀d̀òkpò fɔ̀tò̀ó'̀tɔ̀ t̀n
 1sg show picture every picture.owner GEN
 * 'I showed its owner every picture.'

In Akan, a related Kwa-language of Ghana, pronominal or definite themes, which are high in salience, require the SV-construction.

(79) SV and DO construction in Akan (Campbell 1996: 101)

- a. Me-tOnn nwoma no maa Kofi.
 1sg-sold book that gave Kofi
 'I sold the book to Kofi.'
- b. Me-maa Kofi nwoma (*no).
 1sg-gave Kofi book (that)
 'I gave Kofi a/*the book.'

It has been argued that POSS(y, z) and LOC(z, AT y) are weakly equivalent because usually if one of them is true, the other is true, too. If z is located at y, then y is able to exert some ownership on z. Conversely, if y has possession of z, then z must be located in some neighborhood to y for y being able to exert his possession (Wunderlich 2006: 151). For that reason possession is often expressed by means of a locative construction (e.g., Russian *u menja kniga* 'at me.GEN book' means 'I have a book'). Note that POSS(y, z) and LOC(z, AT y) are not exactly converse to each other because AT y refers to some neighboring region of y rather than to y itself. However, this fact doesn't seem to have any influence on the capability of (74a,b) to represent alternative readings of one of the same verb; what counts here is the difference in argument hierarchy.

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